



## Repair Manual

Golf Variant 2007 ➤  
Jetta 2005 ➤  
Golf Variant 2010 ➤  
Jetta 2011 ➤

### 4-Cylinder Diesel Engine (2.0L Engine, Common Rail)

Engine ID	CBD A	CBD B	CBE A	CEG A	CJAA				
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Edition 10.2023





## List of Workshop Manual Repair Groups

### Repair Group

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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## 00 – General, Technical Data

### 1 Technical Data

(Edition 10.2023)

MEX5R009321 - 10.18.2023

⇒ [“1.1 Engine Number”, page 1](#).

⇒ [“1.2 Engine Specifications”, page 1](#).

#### 1.1 Engine Number

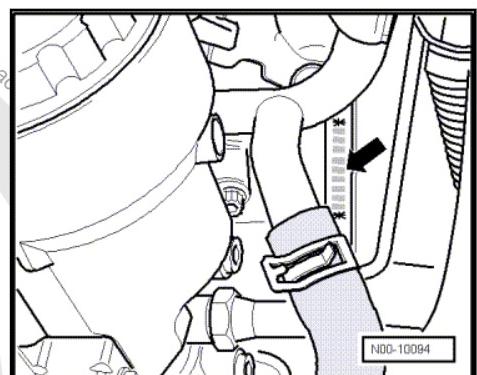
- ◆ Four-letter engine codes were introduced in MY 2008.
- ◆ The first three positions describe the mechanical engine structure. They are stamped on the engine. The fourth position describes the engine output and depends on the Engine Control Module - J623- .
- ◆ The four-letter engine code is on the type label, the vehicle data label and the Engine Control Module - J623- .
- ◆ The vehicle data label is located in both the customer maintenance schedule and on the vehicle rear in the spare tire well or on the luggage compartment floor.



#### Note

*Vehicles for some countries do not have a type label. Vehicle data label and type label locations. Refer to ⇒ Maintenance ; Booklet 20.1 .*

- ◆ The engine number (“engine code” and “serial number”) are located at the engine/transmission joint -arrow-.
- ◆ A sticker with the “engine code” and “serial number” is also on the toothed belt guard.
- ◆ The engine number consists of up to nine characters (alpha-numeric).
- ◆ The first part (maximum four letters) represents the “engine code”, the second part (six digit) is the “serial number”.
- ◆ If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter.



#### 1.2 Engine Specifications

Codes	CBEA	CJAA
Manufactured	from 04/2008	from 05/2009
Emissions values	in accordance with LEV II standard	ULEV2 Standard
Displacement	liters 2.0	2.0
Output	kW at RPM 103/4000	103/4000
Torque	Nm at RPM 320/1750 to 2500	320/1750 to 2500
Bore	Diameter in mm 81.0	81.0
Stroke	mm 95.5	95.5
Valves per cylinder	4	4
Compression ratio	16.5	16.5



Codes		CBEA	CJAA
Diesel fuel	in accordance with	ASTM D 975 Standard <sup>1)</sup> 1-3-4-2	ASTM D 975 Standard <sup>1)</sup> 1-3-4-2
Ignition sequence		yes	no
Balance Shaft Assembly		yes	yes
NOx Reduction Catalytic Converter		yes	yes
Slip Catalyst		yes	yes
Exhaust Gas Recirculation (EGR)		yes	yes
Turbocharger, Supercharger		yes	yes
Charge Air Cooler		yes	yes
Particulate Filter		yes	yes

1) with a sulfur content less than 15 mg/kg of diesel fuel





## 10 – Engine Assembly

### 1 Engine, Removing and Installing

- ⇒ [“1.1 Engine, Removing”, page 3](#)
- ⇒ [“1.2 Transmission and Engine, Disconnecting and Assembling”, page 12](#)
- ⇒ [“1.3 Engine, Securing to Engine and Transmission Holder VAS6095A”, page 14](#)
- ⇒ [“1.4 General Installation Information”, page 15](#)

#### 1.1 Engine, Removing

Special tools and workshop equipment required

- ◆ Lifting Tackle - 3033-
- ◆ Hose Clamps - Up To 25mm - 3094- (vehicles with manual transmission)
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ Step Ladder - VAS5085-
- ◆ Shop Crane - VAS6100-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Hose Clip Pliers - VAS6362-
- ◆ Transportation Lock - T10404-
- ◆ Engine Bung Set - VAS6122- (not illustrated)



#### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations.*
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*



#### DANGER!

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 277 .*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 279 .*

*Always pay attention to these instructions before and during work.*



## Note

- ◆ Subframe mount. Refer to ["2 Subframe Mount, except Jetta from MY 2011", page 18](#).
- ◆ Overview - Body Side Cooling System Components. Refer to ["1.2 Overview - Cooling System Components, Body Side", page 174](#).
- ◆ Overview - Fuel Filter. Refer to ["6.2 Overview - Fuel Filter", page 227](#).
- ◆ Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ["3.2 Overview - Turbocharger with Exhaust Manifold and Attachments", page 244](#).
- ◆ Overview - Charge Air Cooler Components. Refer to ["4.2 Overview - Charge Air Cooler Components", page 265](#).
- ◆ Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to ["1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#).
- ◆ Overview - EGR Components. Refer to ["3.1.1 Overview - Exhaust Gas Recirculation, Engine Codes CBDA, CBDB, CEGA", page 378](#).
- ◆ Hose connections are secured with either spring or hose clamps.
- ◆ Always replace clamp-type clips with spring-type clips.
- ◆ -VAS6362- or the -VAS6340- are recommended for installing spring clips.
- ◆ The Battery - A- ground cable must be disconnected for the following procedure. For this reason check if a coded radio is installed. If necessary, obtain anti-theft code beforehand.
- ◆ All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.
- ◆ The engine is removed forward together with the transmission.



### WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ◆ Route all lines and wires in their original locations.
- ◆ For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.
- ◆ Make sure that there is sufficient clearance to all moving or hot components.

## Requirements

- Ignition switched off.
- Engine must be cold.



## Procedure

- Check the DTC memory for all control modules before removal. Refer to Vehicle Diagnostic Tester "Vehicle Self-Diagnosis".
- Remove the engine cover! Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Remove the air filter housing. Refer to ["3.15 Overview - Air Filter", page 311](#).
- Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Loosen the spring clamps using the -VAS6362- .

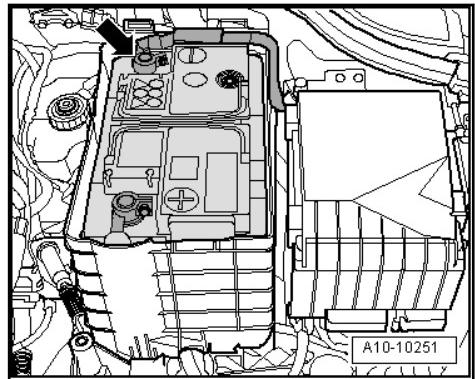


### Caution

*Electronic components could be destroyed when the Battery - A- is disconnected:*

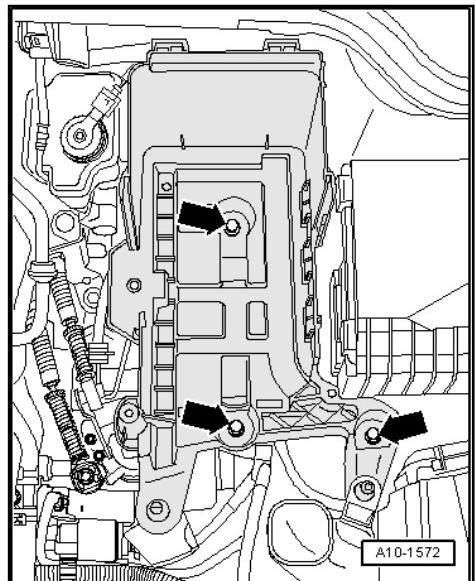
- ◆ Complete the steps for disconnecting the Battery - A - .

- When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to ["Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting](#) .



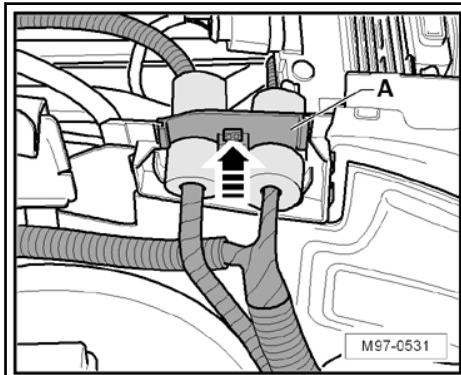
- Remove the Battery - A- and the battery tray -arrows-.
- Disconnect on the Engine Control Module - J623 - :

- ◆ Refer to ["4 Engine Control Module", page 322](#) .

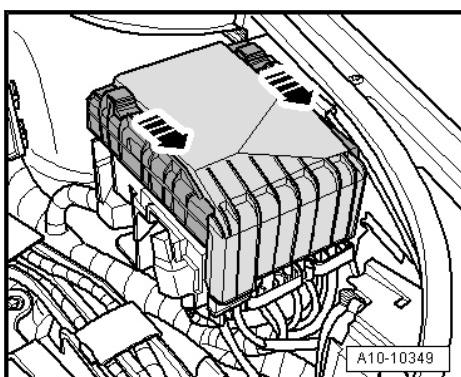




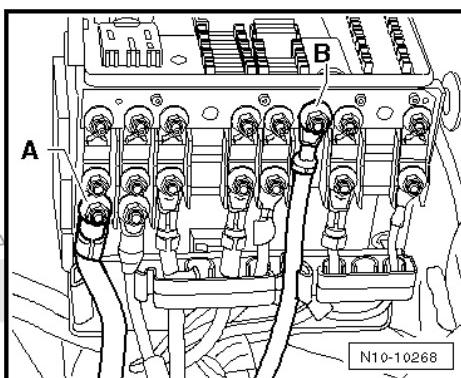
- Release the pass-through for the engine wiring harness -A- in direction of -arrow- and pull it off upward.



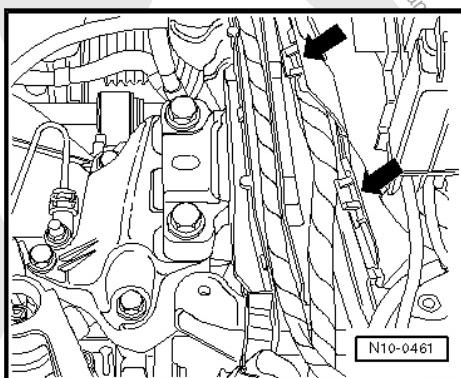
- Remove the E-box cover from the engine compartment by sliding both latches in the direction of -arrows-.



- Disconnect the wire from the Generator - C- -A- and the wire from the Battery - A- -B- at the fuse panel.

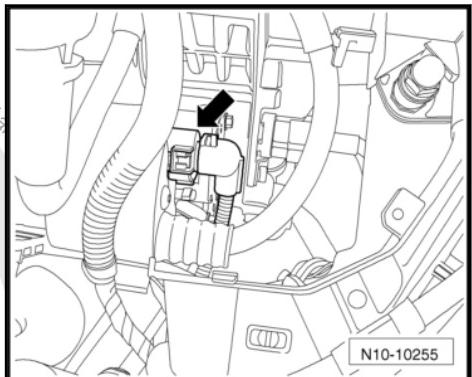


- Open all the cable guide locking mechanisms on the longitudinal member -arrows-.

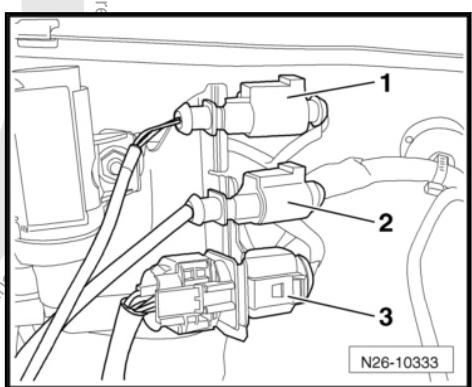




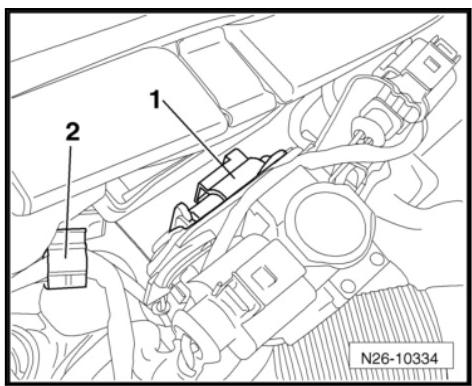
- Disconnect -arrow- from the Starter - B- .
- Remove the ground wire from the transmission holder.



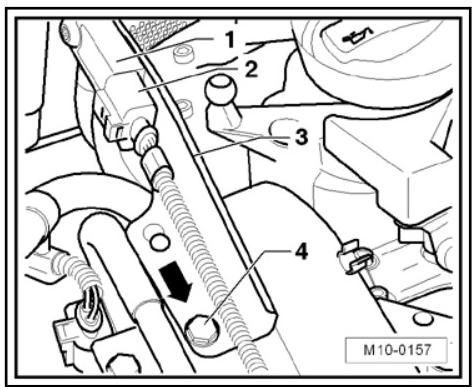
- Disconnect the connector for the Exhaust Gas Temperature Sensor 2 - G448- -1-, the »black« connector for Exhaust Gas Temperature Sensor 1 - G235- -2- as well as the connector for the Heated Oxygen Sensor - G39- -3- on the plenum chamber bulkhead.



- Disconnect the connector for the Exhaust Gas Temperature Sensor 3 - G495- -1- (attached behind the bracket).
- Disconnect the connector -2- from the Exhaust Pressure Sensor 2 - G451- -1-.

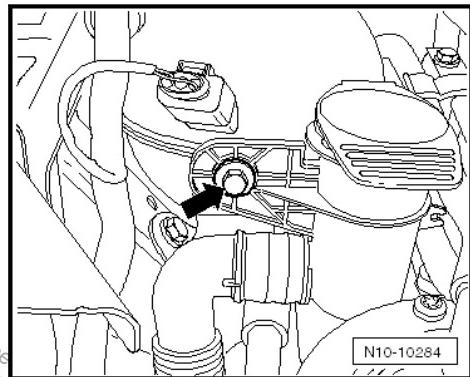


- Remove the bolt -4- and the bracket -3- with the Exhaust Pressure Sensor 2 - G451- -1- in the direction of -arrow- and set aside (control lines remain connected).
- Unbutton the heat shield and disconnect the connector from the Exhaust Pressure Sensor 1 - G450- . Refer to [“1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 336](#) .
- Disconnect the control wire from the Exhaust Pressure Sensor 1 - G450- . Loosen the spring clamp using the -VAS6362- .
- Remove the bolts and bracket with the Exhaust Pressure Sensor 1 - G450- and lay them aside (the control wire to the particulate filter remains connected).
- Rotate the Wastegate Bypass Regulator Valve - N75- out of the holder and set it on the engine.





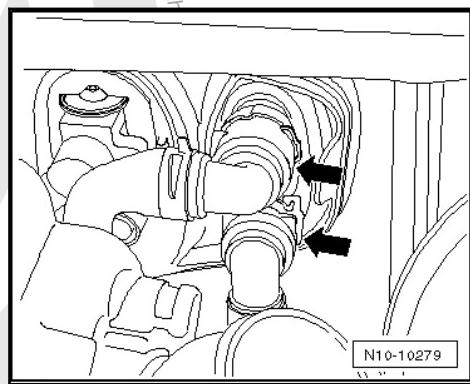
- Remove the screw -arrow- and move the windshield washer fluid reservoir filler tube to the side.
- Remove the coolant reservoir and set it on the engine (coolant hoses stay connected).
- Remove the fuel filter. Refer to ["6.3 Fuel Filter, Removing and Installing", page 229](#).
- Remove the Auxiliary Fuel Pump - V393-. Refer to ["6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing", page 236](#).
- Disconnect the vacuum hose from the brake booster.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
- Drain the coolant. Refer to ["1.10 Coolant, Draining and Filling", page 192](#).
- Disconnect the coolant hoses between the engine and radiator. Refer to ["1.2 Overview - Cooling System Components, Body Side", page 174](#), Overview - Body Side Cooling System Components.
- Open the quick-release couplings for the heat exchanger -arrows- on the plenum chamber bulkhead.



**Note**

*Catch leaking coolant with the -VAS6208- .*

- Disconnect the connecting hoses between the engine and the charge air cooler. Refer to ["4.2 Overview - Charge Air Cooler Components", page 265](#), Overview - Charge Air Cooler Components
- Extract the refrigerant from the A/C system. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .
- Remove the refrigerant lines on the A/C compressor and condenser and secure them on the body without tension. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .
- Remove the lock carrier. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Lock Carrier; Lock Carrier with Attachments, Removing and Installing .





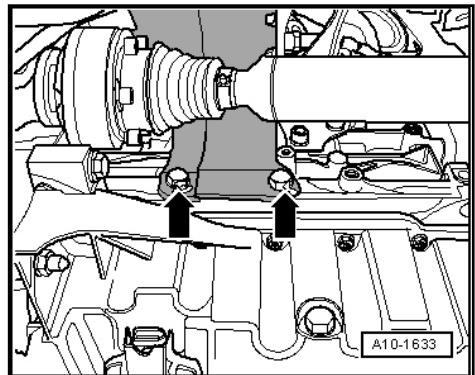
- Remove the right drive axle heat shield -arrows-.
- Dismount the drive axles only from the transmission. Refer to → Suspension, Wheels, Steering; Rep. Gr. 40 ; Drive Axles, Removing and Installing .



#### Caution

*The decoupling elements between the particulate filter and NOx reduction catalytic converter can be damaged. When removing and installing:*

- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- ◆ *Use the -T10404- to secure the decoupling element from stretching.*



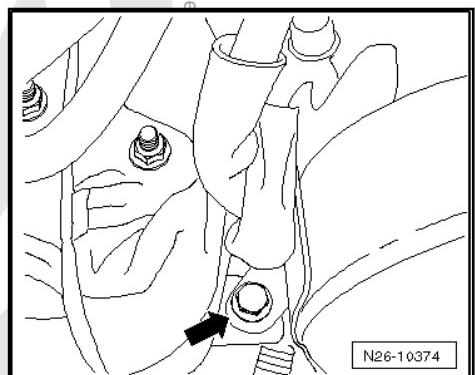
- Remove the lower bracket for the particulate filter.
- Remove the exhaust gas recirculation filter -Item 9- [⇒ Item 9 \(page 380\)](#) .



#### Note

*Remove the nuts above the bracket with the -T10384- .*

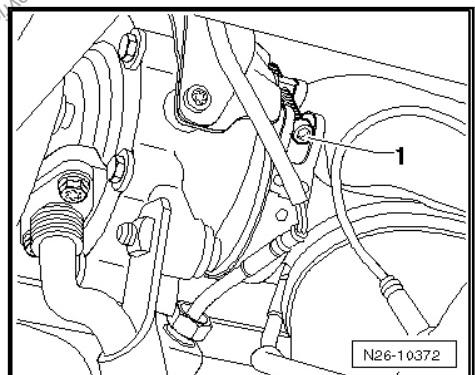
- Remove the screw -arrow- on the top bracket for the particulate filter. Loosen the bracket on the cylinder head.



- Loosen the clamp -1- between the particulate filter and the turbocharger.
- Secure the particulate filter without tension on the body.

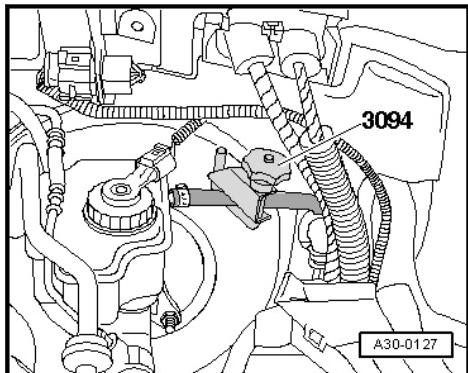
#### Vehicles with Manual Transmission:

- Remove the shift mechanism from the transmission. Refer to → 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .





- Clamp off the return hose to the master cylinder using the -3094- .

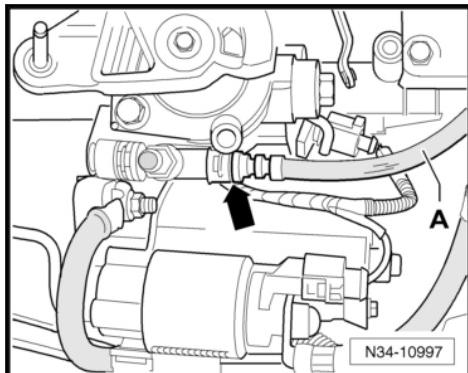


- Remove the clamp -arrow- for the hydraulic clutch hydraulic line -A- all the way.
- Pull the hydraulic line -A- out of the breather/slave cylinder and seal it off.



**Caution**

*Do not operate clutch pedal any more.*



**Vehicles with DSG® Transmission:**

- Disconnect the selector lever cable from the transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

**Continuation for All Vehicles:**

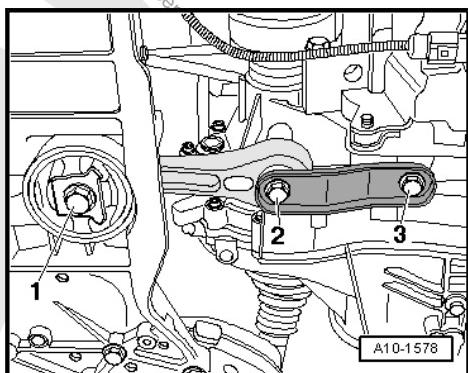
- Remove/disconnect all wires necessary from engine/transmission and free them up.



**Note**

*Verify that all hose and line/wire connections between the engine, transmission and body have been disconnected.*

- Remove the bolts -1 to 3- and then remove the pendulum support.





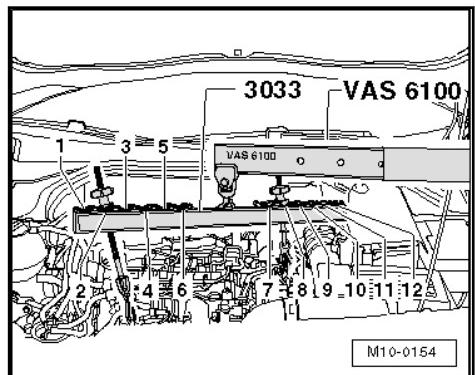
- Engage the -3033- as follows and support the »Engine/transmission assembly« in its installation position using the - VAS6100- .

Vibration damper side:

- item 2

Flywheel side:

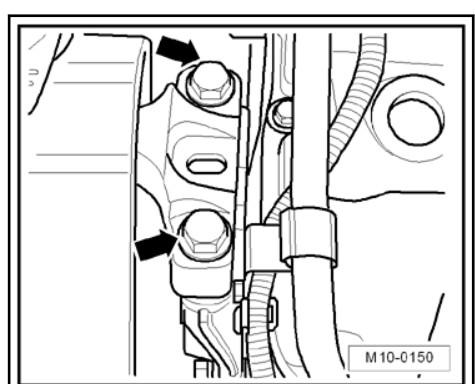
- item 8



M10-0154

- Remove the subframe bolts -arrows- on the engine.

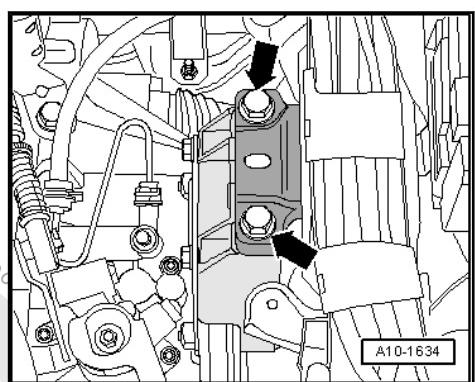
**Vehicles with Manual Transmission:**



M10-0150

- Remove the subframe bolts -arrows- on the transmission.

**Vehicles with DSG® Transmission:**



A10-1634

- Remove the subframe bolts -arrows- on the transmission.

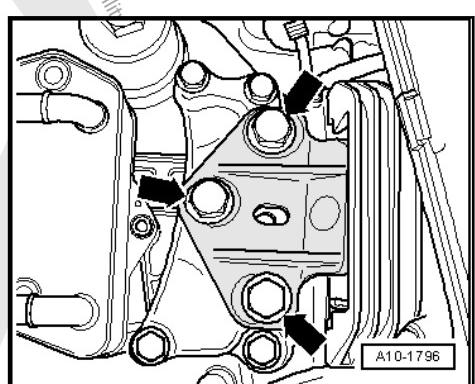
**Continuation for All Vehicles:**



#### Note

When removing the »engine/transmission subassembly«, guide it out carefully to avoid damaging it.

- Lift the »engine/transmission assembly« slightly and remove it toward the front.
- Separate the transmission from the engine. Refer to [»1.2 Transmission and Engine, Disconnecting and Assembling«, page 12](#) .



A10-1796

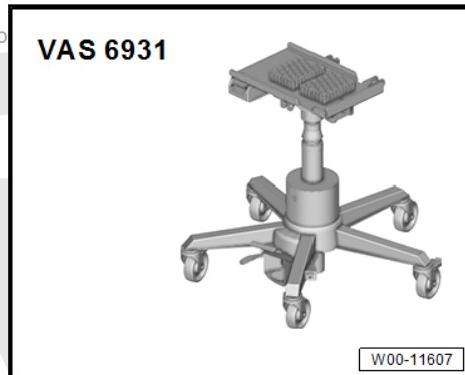
Secure the engine on the -VAS6095A- when performing repair work. Refer to [»1.3 Engine, Securing to Engine and Transmission Holder VAS6095A«, page 14](#) .



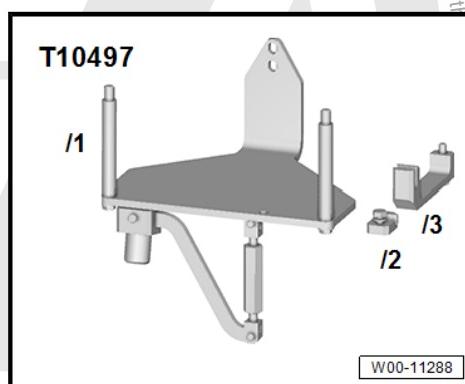
## 1.2 Transmission and Engine, Disconnecting and Assembling

### Special tools and workshop equipment required

- ◆ Engine/Gearbox Jack - VAG1383A- or Engine and Gearbox Jack - VAS6931-



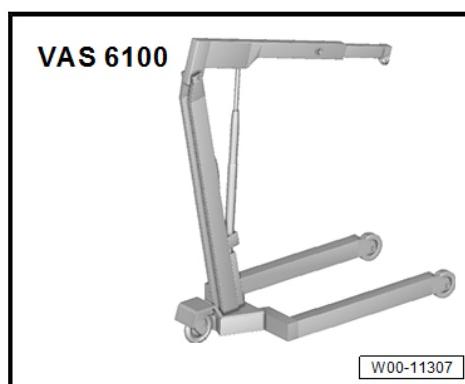
- ◆ Assembly Tool - T10497B- with Bolts -T10497/1-



- ◆ Engine/Gearbox Support Shackle - 10-222 A/12-



- ◆ Shop Crane - VAS6100-





**Separating.** Refer to [“1.2.1 Separating”, page 13](#).

**Assembling.** Refer to [“1.2.2 Assembling”, page 14](#).

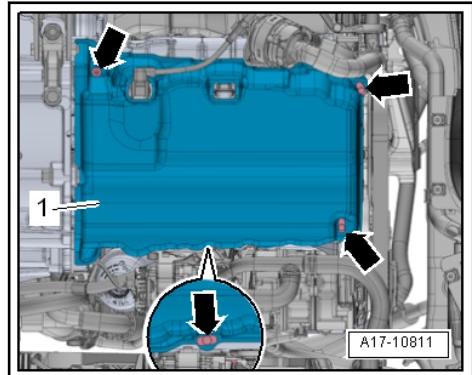
## 1.2.1 Separating

### Conditions

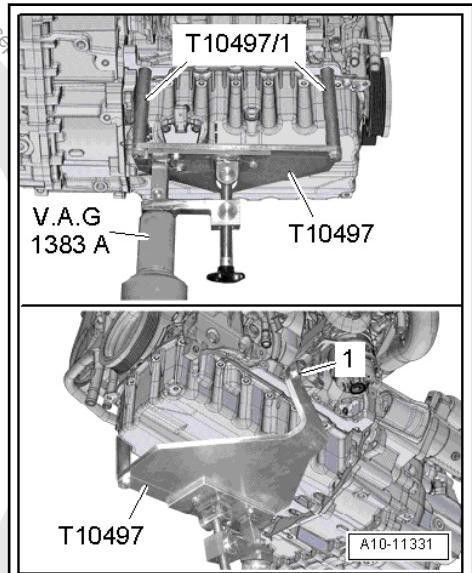
- The engine/transmission subassembly is removed. Refer to [“1.1 Engine, Removing”, page 3](#).

### Procedure

- If necessary, loosen the fasteners -arrows- and remove the noise insulation -1-.



- Position the -T10497A- on the cylinder block with the -T10497/1-
- Secure the -T10497- on the cylinder block to do so tighten the bolt -1- to 20 Nm.
- Lower the engine/transmission assembly using the -VAS6100- and insert the -VAG1383A- on the -T10497-.



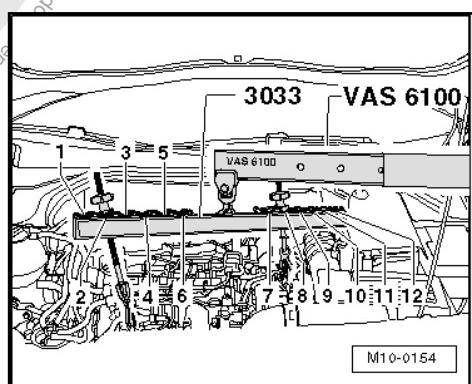
- Loosen the -3033- from the -VAS6100- .
- Remove the starter ⇒ Electrical Equipment; Rep. Gr. 27 ; Starter, Removing and Installing .

### Engine with DSG Transmission:

- Remove the coolant hoses from the transmission fluid cooler and seal off the openings.

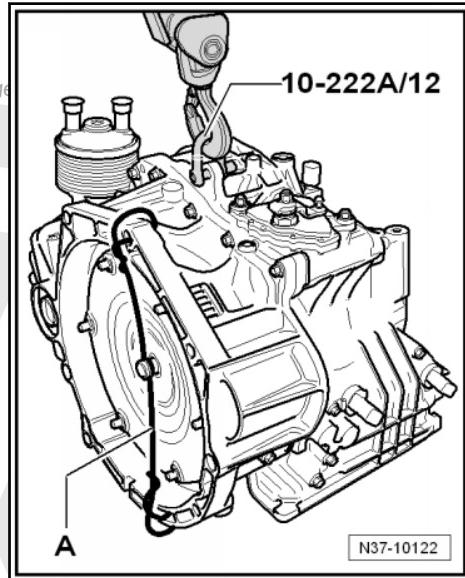
### Continuation for All Transmission Types:

- Loosen and free up all connections between the transmission and the engine.





- Secure the transmission with -10-222A/12- on the - VAS6100- but do not lift.
- Remove the upper engine/transmission connecting bolts.
- Before removing the last connecting bolts, support the transmission with the Shop Crane .
- Remove the lower engine/transmission connecting bolts.
- Separate the transmission from the engine; when doing this, guide the transmission.



## 1.2.2 Assembling

Assemble in the reverse order of removal, while paying attention to the tightening specifications:

- For vehicles with a manual transmission, refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .
- For vehicles with a DSG® transmission, refer to ⇒ 6-Speed DSG Transmission 02E; Rep. Gr. 34 .

## 1.3 Engine, Securing to Engine and Transmission Holder - VAS6095A-

### Special tools and workshop equipment required

- ◆ Lifting Tackle - 3033-
- ◆ Engine and Transmission Holder - VAS6095A-
- ◆ Engine/Transmission Holder - Universal Mounting - VAS6095/1-
- ◆ Shop Crane - VAS6100-
- ◆ Assembly Support - T10497B-

Secure the engine to the Engine and Gearbox Bracket - VAS6095A- when working on the engine.

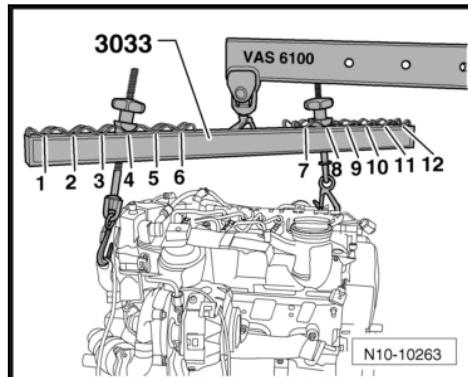
### Conditions

- Transmission is separated from the engine. Refer to ⇒ “[1.2 Transmission and Engine, Disconnecting and Assembling](#)”, page 12 .



## Procedure

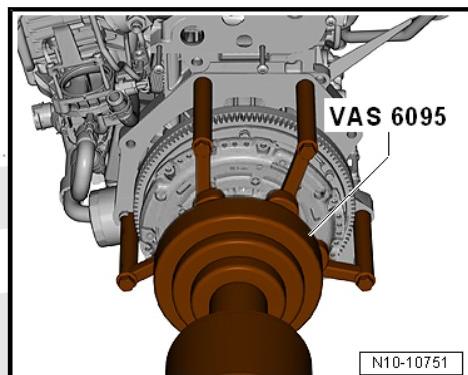
- Engage the -3033- as follows and lift up with the -VAS6100- .
- Flywheel side:
- item 4
- Vibration damper side:
- item 8
- Lower the engine from the -T10497B- using the -VAS6100- .



- Secure the engine on the -VAS6095A-

## Tightening Specification

Component		Nm
Bolts/nuts	M6	10
	M8	20
	M10	45
	M12	65



## 1.4 General Installation Information



### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations.*
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*

Install in reverse order of removal. Note the following:

### Servicing the Clutch:

- ◆ Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 30 .
- ◆ Vehicles with DSG® transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 30 .
- Check that the alignment bushings for centering the engine/transmission are installed inside the cylinder block. Install them if necessary.
- Make sure there is enough clearance to the subframe and radiator when installing the »engine/transmission assembly«.
- Adjust the subframe mount. Refer to [⇒ “2.3 Subframe Mount, Adjusting”, page 21](#) .



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## Note

- ◆ Subframe mount tightening specifications. Refer to ⇒ [“2.1 Overview - Subframe Mount”, page 18](#), Overview - Subframe Mount.
- ◆ Electrical connections and routing. Refer to ⇒ Electrical Equipment; Rep. Gr. 97.

### Vehicles with Manual Transmission:

- Install the hydraulic clutch hydraulic line. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 30 .
- Install the transmission shift mechanism and adjust it if necessary. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .

### Vehicles with DSG® Transmission:

- Install the transmission selector lever cable and adjust it if necessary. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

### Continuation for All Vehicles:

The Additional Numbered Procedures Must Be Followed to Ensure the Particulate Filter with the NOx Reduction Catalytic Converter Is Installed without Tension:

## Note

- ◆ Make sure the particulate filter is not installed under tension after assembly.
- ◆ Always replace the self-locking nuts, seals, gaskets and clamps.



### Caution

*The decoupling elements between the particulate filter and NOx reduction catalytic converter can be damaged. When removing and installing:*

- ◆ Do not bend the decoupling element more than 10°.
- ◆ Do not stretch the decoupling element.
- ◆ Do not damage the wire mesh on the decoupling element.
- ◆ Use the -T10404- to secure the decoupling element from overbending.

- Install the particulate filter with NOx reduction catalytic converter and the EGR filter. Refer to ⇒ [“1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 345](#) .
- Attach the drive axles to the transmission. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Drive Axles, Removing and Installing .



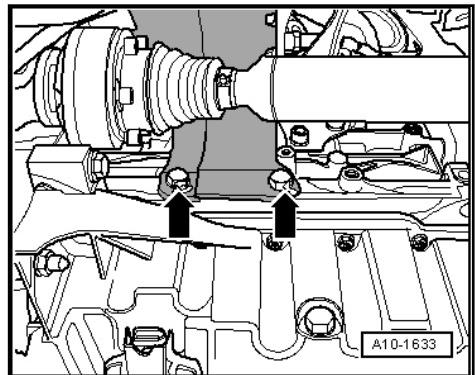
- Install the right drive axle heat shield -arrows-.

Vehicles with Manual Transmission:

- Tightening specification. Refer to ⇒ 6-speed Manual Transmission 02Q; Rep. Gr. 34 .

Vehicles with DSG® transmission:

- Tightening specification. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .
- Install the lock carrier. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Lock Carrier; Lock Carrier with Attachments, Removing and Installing
- Secure the refrigerant lines on the A/C compressor and condenser without tension. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .
- Fill the A/C system. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87
- Install the Battery - A- and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .
- Fill with coolant. Refer to ⇒ “[1.10 Coolant, Draining and Filling](#)”, page 192 .
- Fill the fuel system. Refer to ⇒ “[3.10 Fuel System, Filling/Bleeding](#)”, page 304 .
- Check the DTC memories of all control modules and erase all DTC entries which may have occurred during the assembly. Refer to Vehicle Diagnostic Tester “Vehicle Self-Diagnosis”.
- Check the headlamp adjustment and adjust if necessary. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions .



### Tightening Specifications

Threaded Connection	Tightening Specification
Bolts and Nuts	
M6	10 Nm
M7	15 Nm
M8	20 Nm
M10	40 Nm
M12	65 Nm. Refer to <sup>1)</sup> .

1) Tightening specification for the M12 collar bolt: 75 Nm



## 2 Subframe Mount, except Jetta from MY 2011

- ⇒ [“2.1 Overview - Subframe Mount”, page 18](#)
- ⇒ [“2.2 Engine-Subframe Mount Adjustment, Checking”, page 21](#)
- ⇒ [“2.3 Subframe Mount, Adjusting”, page 21](#)

### 2.1 Overview - Subframe Mount





### 1 - Bolt

- For the transmission holder to the transmission

Tightening specification:

- Vehicles with a manual transmission. Refer to [Rep. Gr. 34](#).
- Vehicles with DSG® transmission. Refer to [Rep. Gr. 34](#).

### 2 - Bolts

- 50 Nm + 1/4 (90°) additional turn
- Always replace
- For pendulum support to transmission

### 3 - Engine Bracket

- Removing and installing. Refer to ["1.6 Engine Bracket, Removing and Installing", page 46](#).

### 4 - Bolt

- 40 Nm + 1/2 (180 °) additional turn
- Always replace
- For engine bracket to cylinder block
- Note the tightening sequence. Refer to [Fig. "Engine Bracket to Cylinder Block Tightening Sequence", page 20](#).

### 5 - Engine Mount

### 6 - Bolt

- 40 Nm + 1/4 (90 °) additional turn
- Always replace
- For engine mount to body

### 7 - Bracket

### 8 - Bolt

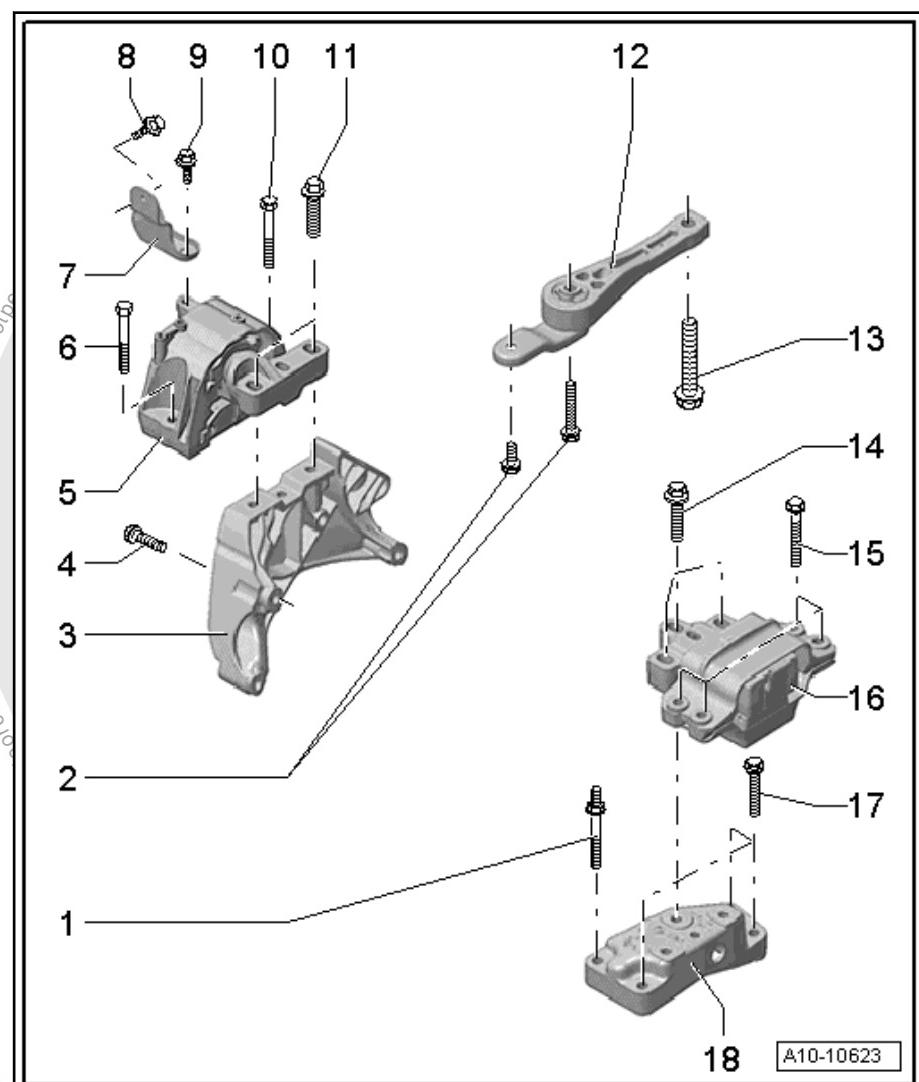
- 20 Nm + 1/4 (90 °) additional turn
- Always replace
- For bracket to engine mount

### 9 - Bolt

- 20 Nm + 1/4 (90 °) additional turn
- Always replace
- For bracket to body

### 10 - Bolt

- 40 Nm + 1/4 (90 °) additional turn



A10-10623



- Always replace
- For engine mount to body

#### 11 - Bolts

- 60 Nm + 1/4 (90 °) additional turn
- Always replace
- For engine mount to engine bracket

#### 12 - Pendulum Support

#### 13 - Bolt

- 100 Nm + 1/4 (90 °) additional turn
- Always replace
- For pendulum support to subframe

#### 14 - Bolt

- 60 Nm + 90° (1/4 turn) additional turn
- Always replace
- For transmission mount to transmission holder

#### 15 - Bolt

- 40 Nm + 1/4 (90 °) additional turn
- Always replace
- Transmission mount to body

#### 16 - Transmission Mount

- The illustration shows the DSG® transmission version

#### 17 - Bolt

- For the transmission holder to the transmission

Tightening specification:

- Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .
- Vehicles with DSG® transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

#### 18 - Transmission Holder

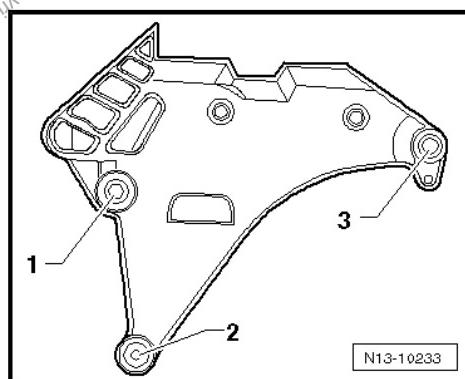
##### Engine Bracket to Cylinder Block Tightening Sequence



##### Caution

*Always use the correct tightening sequence and specifications for the engine bracket bolts. Otherwise tension could develop in the engine bracket and break it.*

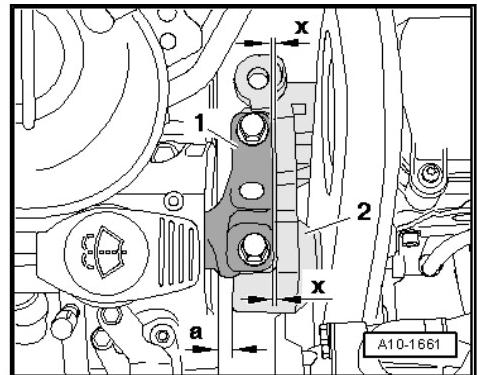
- First tighten the bolts hand-tight in sequence -1 to 3-.
- Then tighten the bolts in that sequence to the tightening specification -Item 4- ⇒ [Item 4 \(page 19\)](#) .





## 2.2 Engine-Subframe Mount Adjustment, Checking

- There must be a distance -a- of at least 10 mm between the engine bracket and right longitudinal member.
- The casting edge on the engine bracket -2- must be parallel to the support arm -1-.
- If the conditions are not met, then adjust the subframe mount. Refer to ["2.3 Subframe Mount, Adjusting", page 21](#).



## 2.3 Subframe Mount, Adjusting

### Special tools and workshop equipment required

- ◆ Engine Support Bridge - 10-222A-
- ◆ Engine Support Bridge - Engine Support 3 - 10-222A/3-
- ◆ Engine Support Bridge - Gearbox Adapter - 10-222A/13-
- ◆ Engine Support Bridge - Engine Support 18 - 10-222A/18-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Hose Clip Pliers - VAS6362-

### Procedure



#### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ Route all lines and wires in their original locations.
- ◆ For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.
- ◆ Make sure that there is sufficient clearance to all moving or hot components.

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Remove the air filter housing. Refer to ["3.15 Overview - Air Filter", page 311](#).
- Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Loosen the spring clamps using the -VAS6362- .



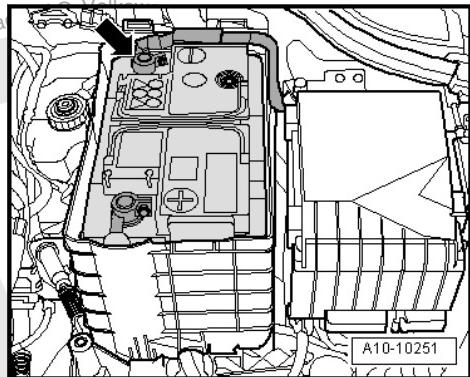
#### Caution

*Electronic components could be destroyed when the Battery - A- is disconnected:*

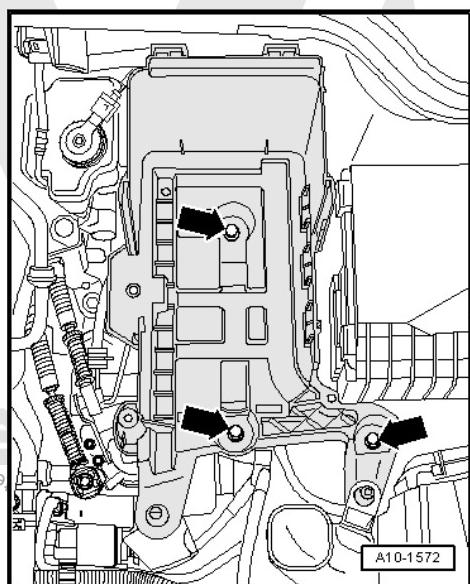
- ◆ Complete the steps for disconnecting the Battery - A- .



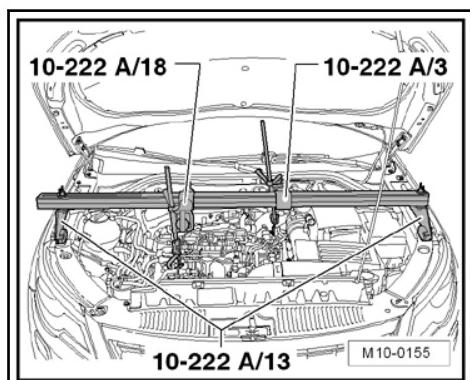
- When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A-. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .



- Remove the Battery - A- and the battery tray -arrows-.



- Remove the Auxiliary Fuel Pump - V393- (fuel lines stay connected). Refer to ⇒ "6.6 Auxiliary Fuel Pump V393 (In-line Fuel Pump), Removing and Installing", page 236 .

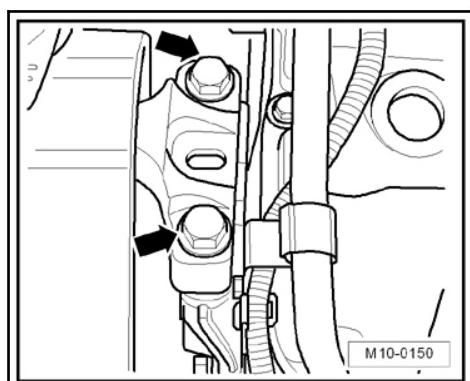


- Position the -10-222A- using the required Adapters as shown and support the engine in the installation position.



*The subframe mount bolts may only be loosened when the engine is supported with the -10-222A- .*

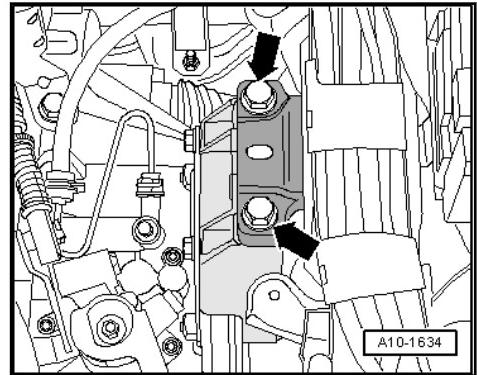
- Replace the engine mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.





#### Vehicles with Manual Transmission:

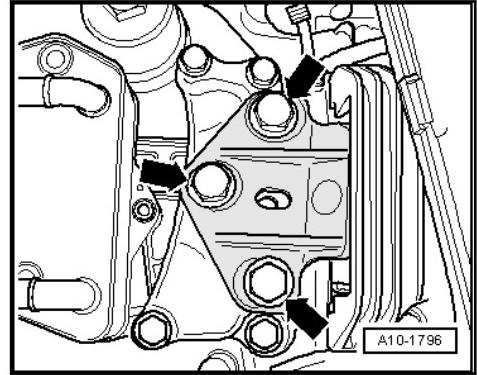
- Replace the transmission mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.



A10-1634

#### Vehicles with DSG® Transmission:

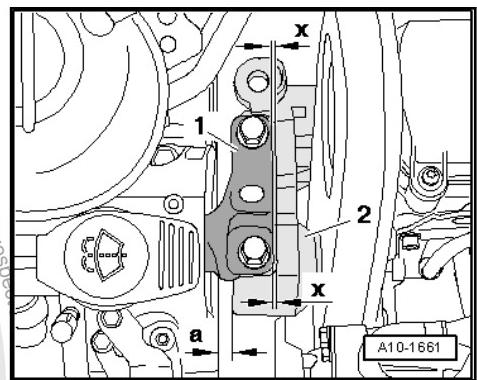
- Replace the transmission mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.



A10-1796

#### Continuation for All Vehicles:

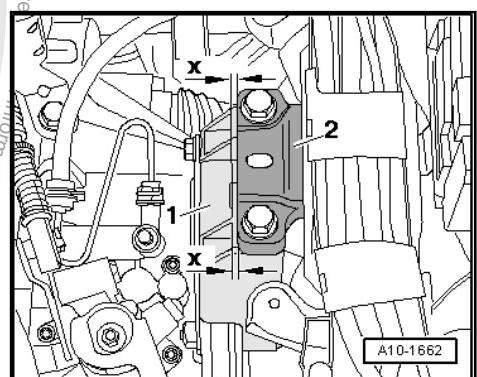
- Loosen left and right support arm bolts approximately two turns.
- There must be a distance -a- of at least 10 mm between the engine bracket and right longitudinal member.
- The casting edge on the engine bracket -2- must be parallel to the support arm -1-.



A10-1661

#### Vehicles with Manual Transmission:

- Make sure that the edges on the support arm -1- and transmission mount -2- are parallel on the transmission side.
- Dimension -x- is the same size on both sides of the mount.



A10-1662



**Vehicles with DSG® Transmission:**

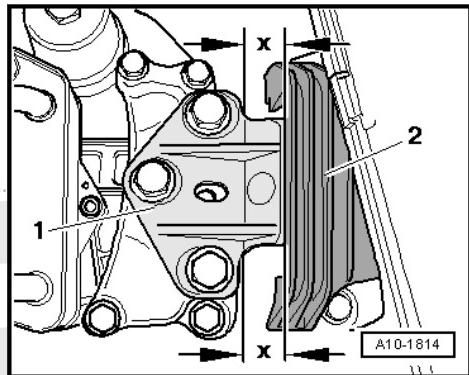
- Make sure that the edges on the support arm -1- and transmission mount -2- are parallel on the transmission side.
- Dimension -x- is the same size on both sides of the mount.

**Continuation for All Vehicles:**

- Tighten the subframe mount bolts.
- Tightening specifications. Refer to [“2.1 Overview - Subframe Mount”, page 18](#), Overview - Subframe Mount.

Further installation is the reverse order of removal. Note the following:

- Check the fuel lines for secure fit.
- Do not interchange supply and return lines (return line is blue or has blue marking, supply line is black).
- Observe the notes after connecting the Battery - A-. Refer to [⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting](#)





### 3 Assembly Mounts, Jetta from 2011

- ⇒ [“3.1 Overview - Subframe Mount”, page 25](#)
- ⇒ [“3.2 Engine Mount, Removing and Installing”, page 27](#)
- ⇒ [“3.3 Transmission Mount, Removing and Installing”, page 30](#)
- ⇒ [“3.4 Pendulum Support, Removing and Installing”, page 32](#)
- ⇒ [“3.5 Engine, Supporting in Installation Position”, page 33](#)
- ⇒ [“3.6 Subframe Mount, Adjusting”, page 37](#)
- ⇒ [“3.7 Subframe Mount, Checking Adjustment”, page 38](#)

#### 3.1 Overview - Subframe Mount





#### 1 - Bolt

- Transmission support to transmission
- Tightening specification. Refer to ⇒ Rep. Gr. 34 ; Subframe Mount; Overview - Subframe Mount .

#### 2 - Bolts

- 50 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Pendulum support to transmission

#### 3 - Engine Support

#### 4 - Bolt

- 40 Nm + 180° (1/2 turn) additional turn
- Replace after removing
- Engine support to engine

#### 5 - Engine Mount

- Removing and installing. Refer to ⇒ [“3.2 Engine Mount, Removing and Installing”](#), page 27 .

#### 6 - Bolt

- 40 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Engine mount to body

#### 7 - Bracket

#### 8 - Bolt

- 20 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Bracket to engine mount

#### 9 - Bolt

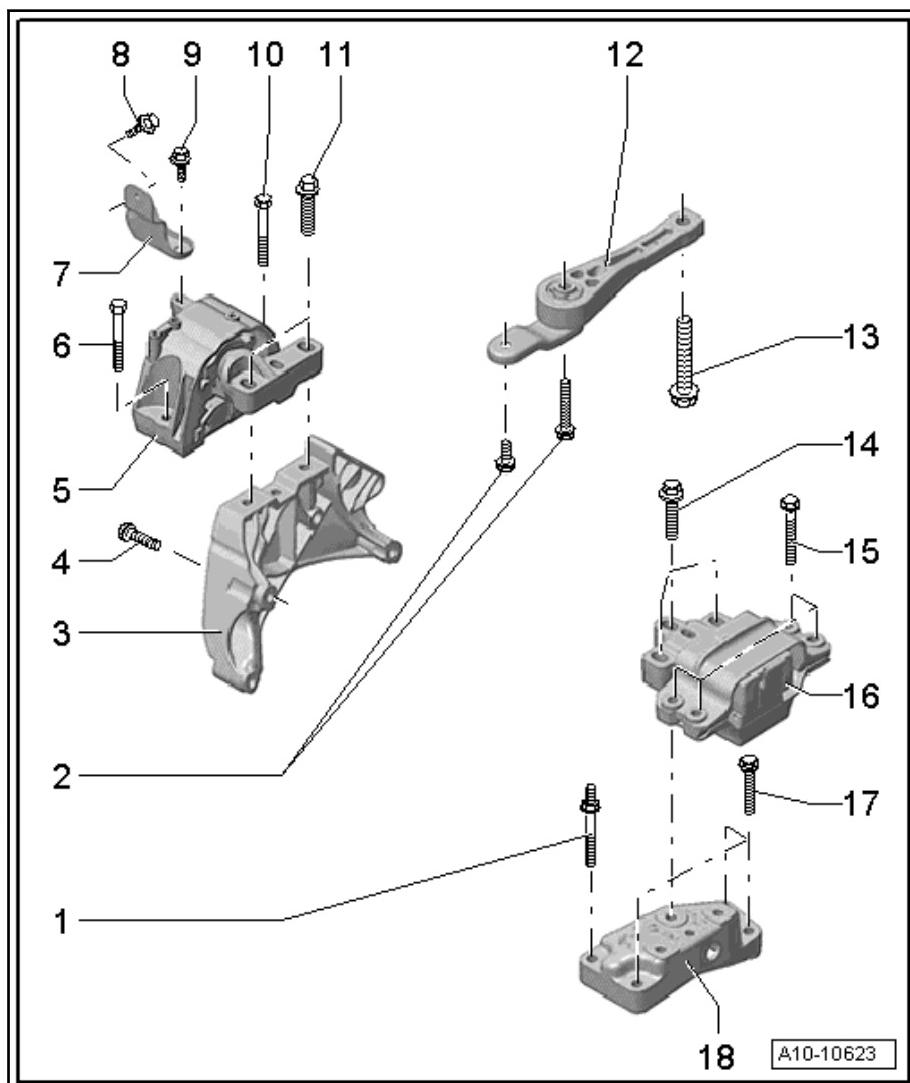
- 20 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Bracket to body

#### 10 - Bolt

- 40 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Engine mount to body

#### 11 - Bolts

- 60 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Engine mount to engine support





## 12 - Pendulum Support

- First install the pendulum support to the transmission and then to the subframe

## 13 - Bolt

- 100 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Pendulum support to subframe

## 14 - Bolt

- 60 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Transmission mount to transmission support

## 15 - Bolt

- 40 Nm + 90° (1/4 turn) additional turn
- Replace after removing
- Transmission mount to body

## 16 - Transmission Mount

- The illustration shows the DSG® transmission version

## 17 - Bolt

- Transmission support to transmission
- Tightening specification. Refer to ⇒ Rep. Gr. 34 ; Subframe Mount; Overview - Subframe Mount .

## 18 - Transmission Support

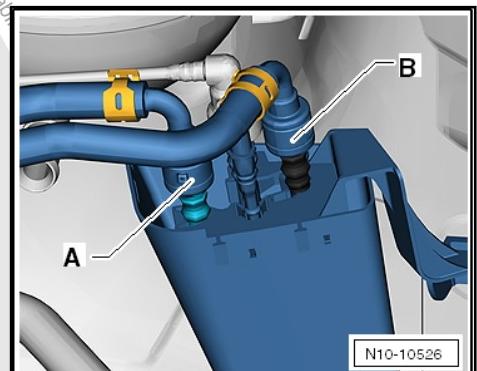
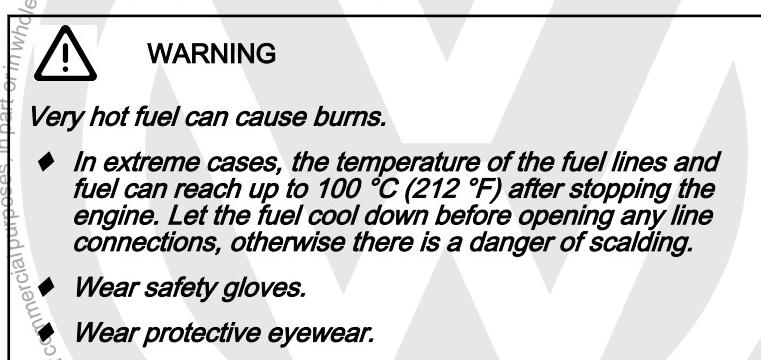
## 3.2 Engine Mount, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-

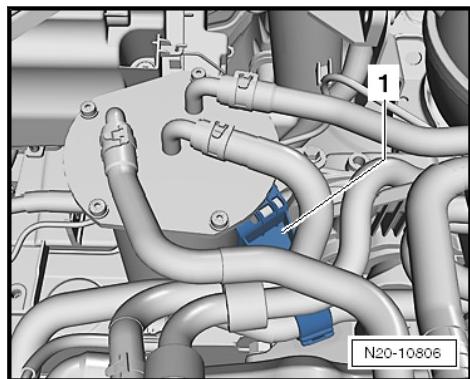
### Removing

- Remove the engine cover. Refer to ⇒ “[1.6 Engine Cover, Removing and Installing](#)”, page 87 .
- Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
- Open the connector couplings -A and B- and remove the fuel lines. Open the connector couplings. Refer to ⇒ “[5 Connector Couplings, Disconnecting](#)”, page 223 .





- Unclip the coolant hose bracket -1-.
- Free up the fuel lines.

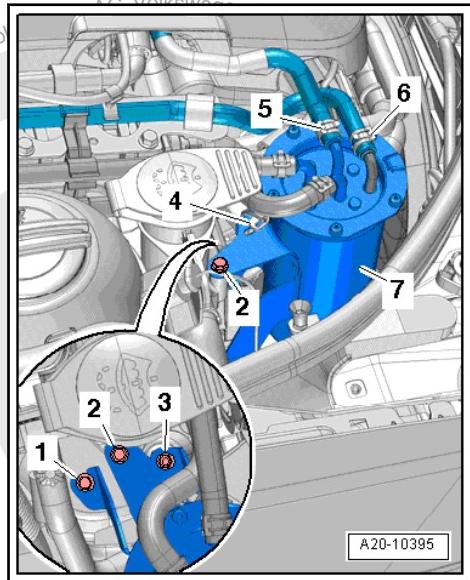


- Remove the fuel filter -7- from the mountings -1 through 3- and lay it on the engine.

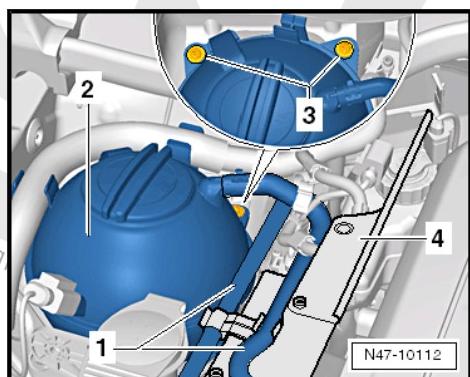
Note

Refer to ⇒ Fuel Supply - Diesel Engines; Rep. Gr. 20 ; Fuel Filter .

- Disconnect and disconnect for the coolant expansion tank -2-.
- Remove the bolts -3- and the coolant expansion tank -2-.
- Unclip and free up the wire -1-.

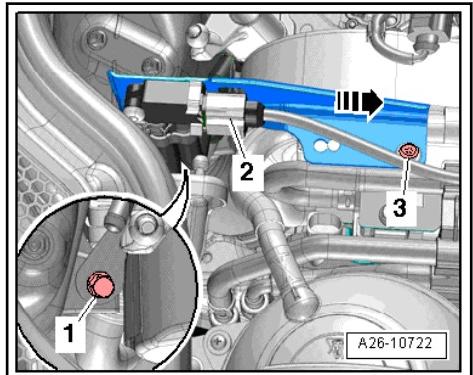


- Lay the coolant reservoir -2- on the engine.
- Disconnect the connector -2-.
- Remove the heat shield and disconnect the connector from the Exhaust Pressure Sensor 1 - G450- . Refer to ⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336 .
- Remove the control line from the Exhaust Pressure Sensor 1 - G450- .
- Loosen the spring clamp using the - VAS6362- .
- Remove the bolts and bracket with the Exhaust Pressure Sensor 1 - G450- and lay them aside (the control wire to the particulate filter remains connected).
- Remove the bolt -3- and then remove the Exhaust Pressure Sensor 2 - G451- from the bracket in direction of -arrow-.

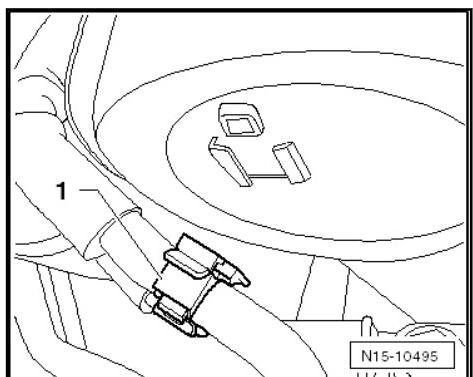




- Remove the bolt -1- at the top of the particulate filter bracket.
- Lay the Exhaust Pressure Sensor 2 - G451- with the bracket on the particulate filter.



- Seal the open lines and connections with clean plugs from the -VAS6122- .
- Lay the Exhaust Pressure Sensor 2 - G451- with the bracket on the particulate filter.



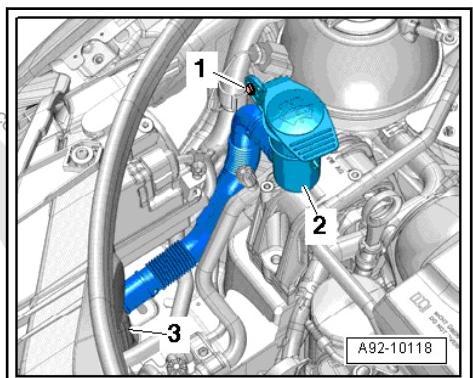
- Remove the bolt -1-.
- Push the filler tube and windshield wiper fluid reservoir filler tube -2- to the side.



**Note**

*Ignore -3-.*

- Support the engine in the installation position. Refer to ["3.5 Engine, Supporting in Installation Position", page 33](#) .
- Tension the engine slightly via the spindles do not lift it.
- Remove the bolts -A- and the bracket.
- Remove the bolts -B and C-.





- Remove the engine mount upward.

#### Installing

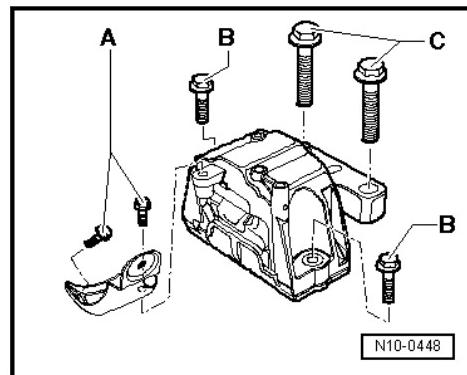
Install in reverse order of removal. Note the following:



#### Caution

*Risk of damaging threads in transmission support by inserting bolts at an angle.*

- ◆ *The transmission support and the transmission mount support arm must be absolutely parallel to each other before installing the bolts. Push the rear of the transmission upward using a floor jack if necessary.*



#### Caution

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines in their original locations.*
- ◆ *To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.*

- Adjust the subframe mount. Refer to [⇒ “3.6 Subframe Mount, Adjusting”, page 37](#).

#### Tightening Specifications

- ◆ Refer to [⇒ “3.6 Subframe Mount, Adjusting”, page 37](#)
- ◆ Refer to [⇒ “3.1 Overview - Subframe Mount”, page 25](#)
- ◆ Refer to [⇒ “1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 345](#)
- ◆ Refer to [⇒ “4.2 Overview - Charge Air Cooler Components”, page 265](#)
- ◆ Fuel filter. Refer to ⇒ Fuel Supply - Diesel Engines; Rep. Gr. 20 ; Fuel Filter .
- ◆ Battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- ◆ Plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

### 3.3 Transmission Mount, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-

#### Removing

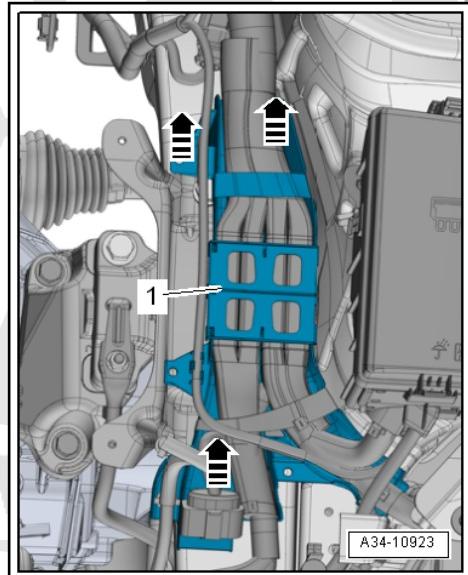
- Remove the engine cover. Refer to [⇒ “1.1 Engine, Removing”, page 3](#).
- Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .



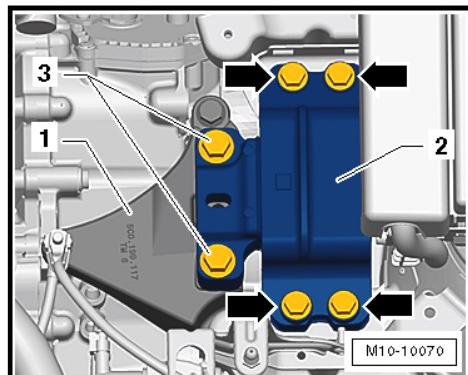
- Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- Remove the air filter housing with the Mass Airflow Sensor - G70- and connecting pipe. Refer to ⇒ “[3.16 Air Filter Housing, Removing and Installing](#)”, page [315](#).
- Support the engine mount in the installed position. Refer to ⇒ “[3.5 Engine, Supporting in Installation Position](#)”, page [33](#).
- Free up the wires at the cable guide.
- Unclip the wiring guide -1- upward in direction of -arrows- and move it slightly to the side.
- Pretension the engine/transmission sub-assembly using the spindles, but do not lift it.



*Ignore -1 and 3-.*



- Remove the bolts -arrows-.
- Remove the bolts -arrows-.





- Remove the engine mount -2-.

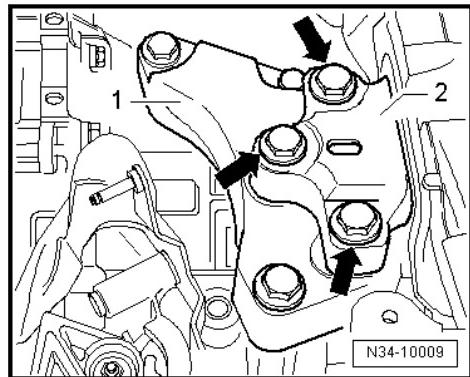
#### Installing

Install in reverse order of removal and note the following:



#### Note

Replace the bolts that were tightened with an additional turn.



#### Caution

*Risk of damaging threads in transmission support by inserting bolts at an angle.*

- ◆ The transmission support and the transmission mount support arm must be absolutely parallel to each other before installing the bolts. Push the rear of the transmission upward using a floor jack if necessary.



#### Caution

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ Route all lines in their original locations.
- ◆ To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.

- Adjust the subframe mount. Refer to [⇒ “3.6 Subframe Mount, Adjusting”, page 37](#).

#### Tightening Specifications

- ◆ Refer to [⇒ “3.1 Overview - Subframe Mount”, page 25](#)

*Refer to [⇒ “4.2 Overview - Charge Air Cooler Components”, page 265](#)*

- ◆ Battery tray. Refer to [⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing](#) .
- ◆ Plenum chamber cover. Refer to [⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing](#) .

## 3.4 Pendulum Support, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-

#### Removing

- Remove the noise insulation. Refer to [⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation](#) .
- Remove the bolt -1-.
- Remove the bolts -2 and 3-.



- Remove the pendulum support.

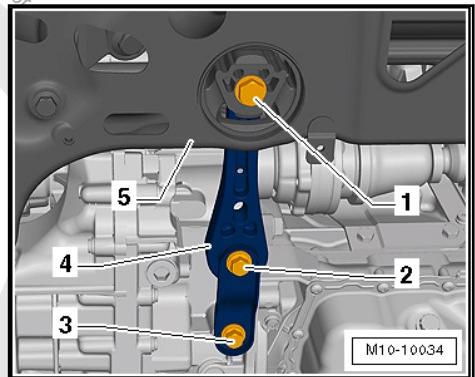
#### Installing

Install in reverse order of removal. Note the following.

- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 : Noise Insulation .

#### Tightening Specifications

- ◆ Refer to ⇒ “3.1 Overview - Subframe Mount”, page 25



### 3.5 Engine, Supporting in Installation Position

#### Special tools and workshop equipment required

- ◆ Engine Support Bridge - 10-222A-
- ◆ Engine Support Bridge - Spindle - 10-222A/11-
- ◆ Engine/Gearbox Support Shackle (2 pc.) - 10-222A/12-
- ◆ Engine Support - Automatic Transmission Hook - 10-222A/7-
- ◆ Engine Support Bridge - Engine Support 28 - 10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 - 10-222A/31-
- ◆ Rail with Holes - T40091/2- from the Engine Support - Basic Set - T40091-
- ◆ Mount - T40093/5- from the Engine Support - Supplement Kit - T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 - 10-222A/28-2-, quantity: 2
- ◆ Engine Support - Basic Set - Square Pipe - T40091/1- (quantity: 2) from the Engine Support - Basic Set - T40091-
- ◆ Engine Support - Basic Set - Movable Joint - T40091/3- (quantity: 2) from the Engine Support - Basic Set - T40091-
- ◆ Engine Support - Movable Joint - T40093/4- (quantity: 2) from the Engine Support - Supplement Kit - T40093A-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-

#### Procedure



##### Caution

*For all repair work, especially in the engine compartment due to the tight working conditions, observe the following:*

- ◆ *Route all lines in their original locations.*
- ◆ *To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.*

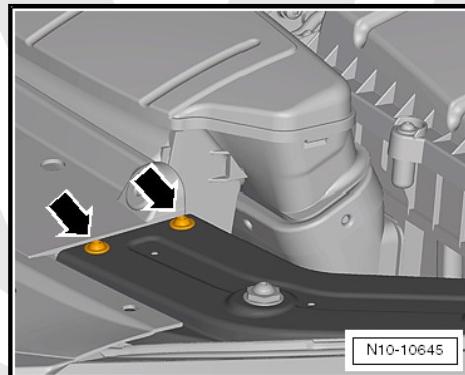
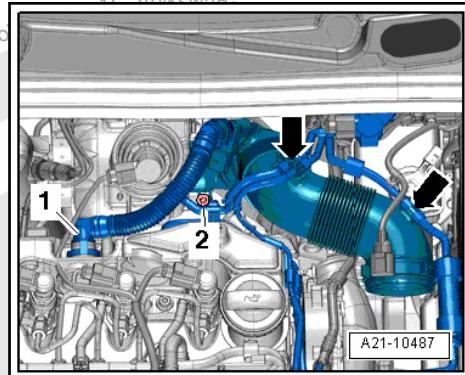


### Caution

#### *Risk of damaging the decoupling element:*

- ◆ **Do not bend the decoupling element more than 10°.**
- ◆ **Do not stretch the decoupling element.**
- ◆ **Do not damage the wire mesh on the decoupling element.**

- Remove the engine cover. Refer to ⇒ “[1.1 Engine, Removing](#)”, [page 3](#).
- Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
- Remove the air filter housing. Refer to ⇒ “[3.16 Air Filter Housing, Removing and Installing](#)”, [page 315](#).
- Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- Press the release buttons and remove the crankshaft housing ventilation hose -1- from the cylinder head cover.
- Disconnect the connector from the crankcase ventilation hose -1-.
- Free up the vacuum hoses -arrows- on the air guide pipe.
- Remove the bolt -2- and tilt the air guide pipe with the intake hose backward and remove from the turbocharger.



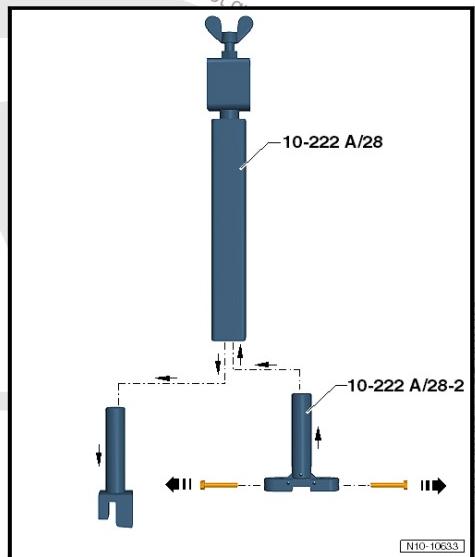


- Remove the lower mounts from the -10-222A/28-.
- Attach the -10-222A/28-2- .
- Remove the bolts in direction of -arrows- for securing the engine support bridge on the lock carrier from the -10-222A/28-2- .



**Note**

*Use the bolts from the -10-222A/28-2- for attaching the -10-222A/28- . Do not use the bolts for the retaining bracket.*

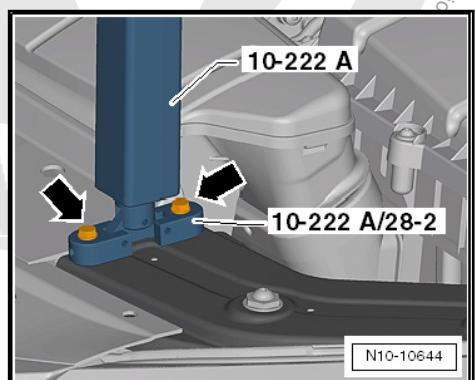


- Install the -10-222A/28- and tighten the bolts -arrows-.
- Bolt tightening specification -arrows- 8 Nm



**Caution**

*A second technician is needed to mount the Engine Support Bridge on the vehicle to prevent the Engine Support Bridge from tipping.*



Assemble engine support bridge as shown.

-10-222A/31A-1- on the suspension strut tower.



1 - Engine Support Bridge -  
Engine Support 31 Adapter  
31-2 - 10-222A/31-2-

2 - Engine Support - Ba-  
sic Set - Moveable Joint -  
T40091/3-

3 - Engine Support Bridge -  
Engine Support 31 Adapter  
31-1 - 10-222A/31-1-

4 - Engine Support - Ba-  
sic Set - Rail with Holes -  
T40091/2-

5 - Engine Support - Supple-  
ment Kit - Movable Joint -  
T40093/4-

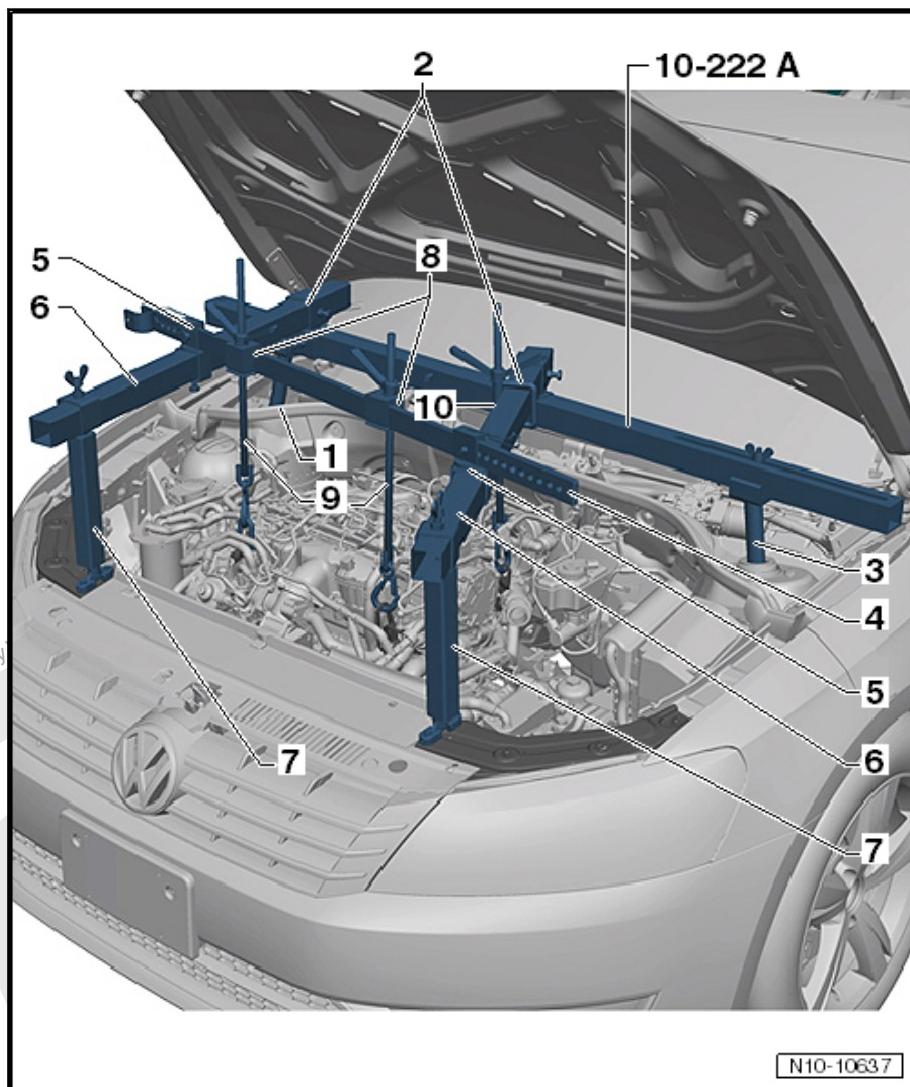
6 - Engine Support - Basic  
Set - Square Pipe - T40091/1-

7 - Engine Support Bridge  
- Engine Support 28 -  
10-222A/28- with Engine Sup-  
port Bridge - Engine Support  
28-2 - 10-222A/28-2-

8 - Engine Support - Supple-  
ment Kit - Mount - T40093/5-

9 - Engine Support Bridge -  
Spindle - 10-222A/11-

10 - Engine Support - Brack-  
et w/Spindle and Hook -  
10-222A/10-



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- Tighten all bolted connections on the -10-222A- hand-tight. While doing so, adjust the height of the -10-222A- parallel over the 10-222A/28- .
- Lightly pretension the engine/transmission assembly using the spindles, but do not lift it.

#### Remove the Engine Support Bridge.

The removal of the engine support bridge is the reverse of installation noting the following.

- Check the adjustment of the subframe mount, in case they were loosened. Refer to [⇒ "2.2 Engine-Subframe Mount Ad-justment, Checking", page 21](#) .
- Install the engine cover. Refer to [⇒ "1.1 Engine, Removing", page 3](#) .
- Install the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

#### Tightening Specification

- ◆ Refer to [⇒ "3.1 Overview - Subframe Mount", page 25](#)
- ◆ Refer to [⇒ "4.2 Overview - Charge Air Cooler Components", page 265](#)



- ◆ Battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ;  
 Battery; Battery Tray, Removing and Installing

## 3.6 Subframe Mount, Adjusting

### Procedure



#### WARNING

*For all repair work, especially in the engine compartment due to the tight working conditions, observe the following:*

- ◆ Route all wires and lines so that the original path is followed.
- ◆ Make sure that there is sufficient clearance to all moving or hot components.

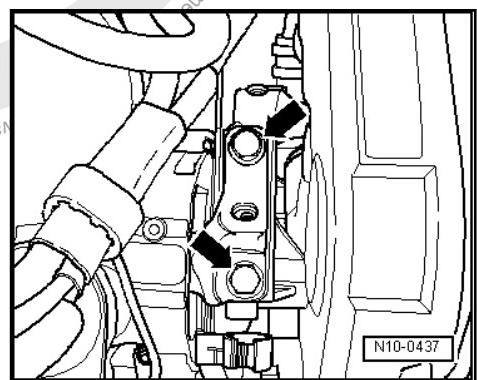
- Support the engine in the installation position. Refer to ⇒ "3.5 Engine, Supporting in Installation Position", page 33 .



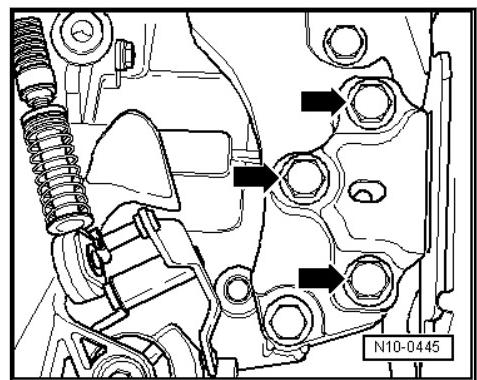
#### Note

*The subframe mount bolts may only be loosened when the engine is supported with the -10-222A- .*

- Replace the engine mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.



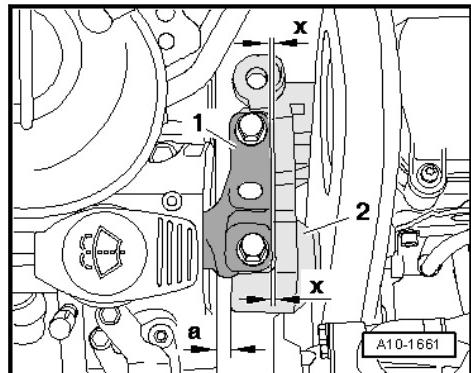
- Replace the transmission mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.
- Loosen the bolts on the engine side and transmission side of the support arm approximately two turns.





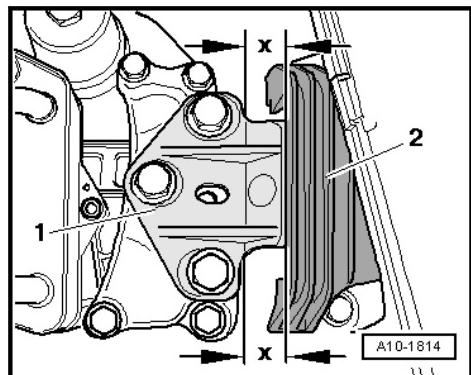
## Engine Mount

- There must be a distance -a- of at least 10 mm between the engine bracket and right longitudinal member.
- The casting edge on the engine bracket -2- must be parallel to the support arm -1-.



## Transmission Mount

- On the transmission side, pay attention that the edges of the support arm -1- and transmission mount -2- are parallel.
- Dimension -x- is the same size on both sides of the mount.
- Tighten the subframe mount bolts.
- Tightening specifications. Refer to ["3.1 Overview - Sub-frame Mount", page 25](#).



Install in reverse order of removal. Note the following:

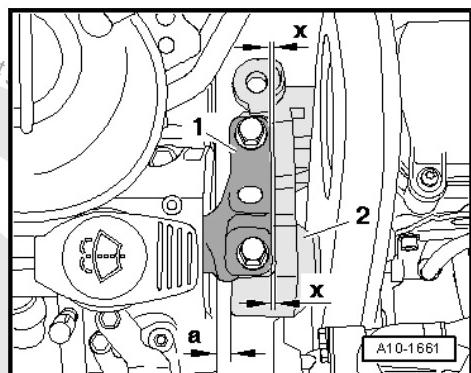
- Check the fuel lines for secure fit.
- Do not interchange the supply and return lines (return lines are blue or have blue markings, supply lines are black).
- Observe the safety precautions after connecting the Battery - A-. Refer to [⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting](#).

## 3.7 Subframe Mount, Checking Adjustment

- There must be a distance -a- of 10 to 13 mm between the engine support and right longitudinal member.
- Casting edge on engine support -2- must stand parallel to the support arm -1-.
- Dimension -x- must be the same in the front and in the rear.



*Distance -a- can also be checked with corresponding round stock.*



If There Is Noise (the Engine or Transmission Hitting the Longitudinal Member When Driving around Curves). Refer to [⇒ "3.6 Subframe Mount, Adjusting", page 37](#).

If the Dimension -a- Is Not within 10 to 13 mm. Refer to [⇒ "3.6 Subframe Mount, Adjusting", page 37](#).



## 13 – Crankshaft, Cylinder Block

### 1 Engine, Disassembling and Assembling

- ⇒ [“1.1 Overview - Ribbed Belt Drive”, page 39](#)
- ⇒ [“1.2 Overview - Cylinder Block”, page 40](#)
- ⇒ [“1.3 Ribbed Belt, Removing and Installing”, page 42](#)
- ⇒ [“1.4 Ribbed Belt Tensioner, Removing and Installing”, page 43](#)
- ⇒ [“1.5 Sub-Assembly Bracket, Removing and Installing”, page 45](#)
- ⇒ [“1.6 Engine Bracket, Removing and Installing”, page 46](#)

#### 1.1 Overview - Ribbed Belt Drive





**1 - Belt Pulley/Vibration Damper**

- Only possible to install in one position - hole are offset

**2 - Bolt**

- 25 Nm

**3 - Generator - C-**

- Removing and installing. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 .

**4 - Bracket**

- For the sub-assembly
- Removing and installing. Refer to ⇒ [“1.5 Sub-Assembly Bracket, Removing and Installing”, page 45](#) .

**5 - Bolt**

- 20 Nm + 1/2 (180 °) additional turn
- Always replace
- Do not lubricate or grease the threads and collar
- additional rotation can occur in several stages

**6 - Ribbed Belt Tensioner**

- To release the tension on ribbed belt, pivot using a open end wrench. Refer to ⇒ [“1.3 Ribbed Belt, Removing and Installing”, page 42](#) .

**7 - A/C Compressor**

- Removing and installing. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .

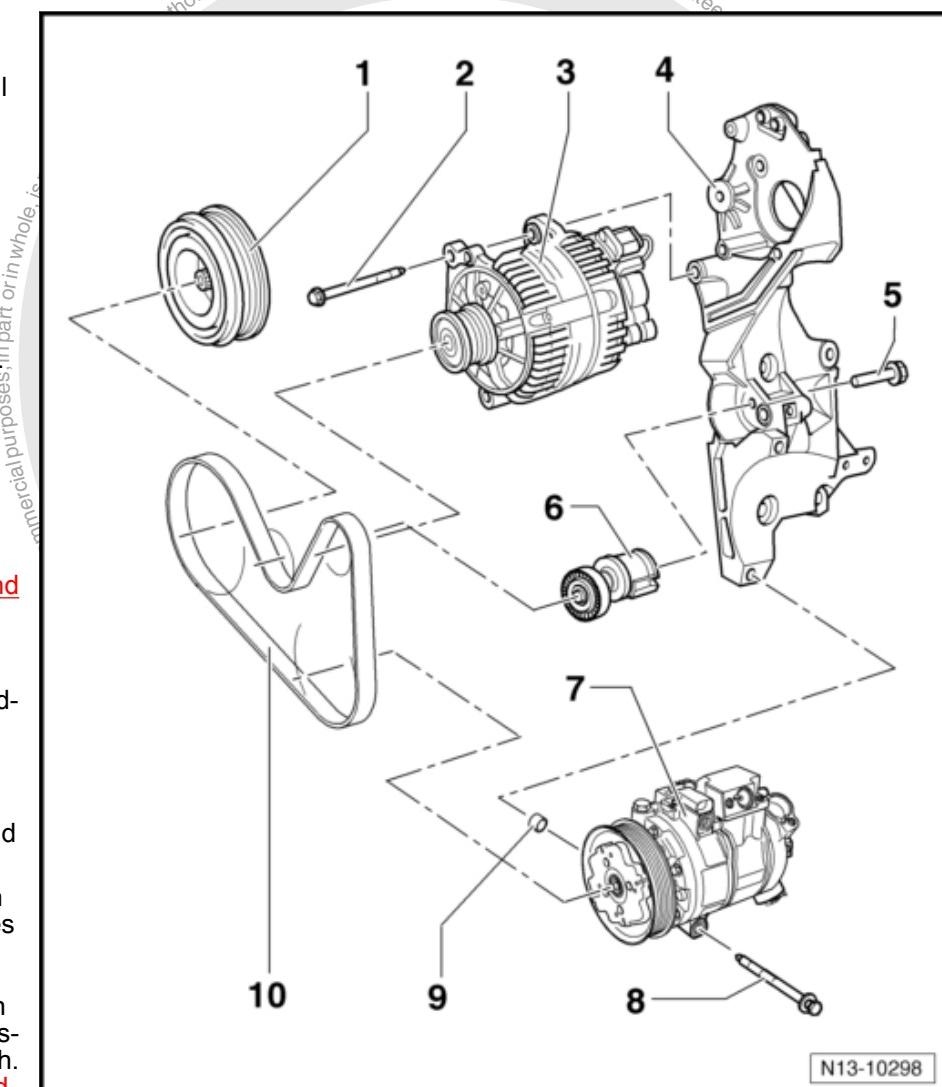
**8 - Bolt**

- 25 Nm

**9 - Alignment Sleeve**

**10 - Ribbed Belt**

- Mark the running direction before removing
- Check for wear
- Do not kink
- Removing and installing. Refer to ⇒ [“1.3 Ribbed Belt, Removing and Installing”, page 42](#) .



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## 1.2 Overview - Cylinder Block



## 1 - Cylinder Block

- Sealing flanges and flywheel, removing and installing. Refer to ["2 Sealing Flange and Flywheel", page 50](#).
- Piston and connecting rod. Refer to ["3 Pistons and Connecting Rod", page 64](#).
- Crankshaft. Refer to ["4 Crankshaft", page 72](#).
- Engine code CBEA with balance shaft assembly
- Balance Shaft Assembly, Removing and installing. Refer to ["2 Lubrication System Components, Engine Code CBEA", page 140](#).

## 2 - Seal

- Always replace

## 3 - Oil Filter Bracket

- Overview - Oil Filter Bracket and Oil Cooler. Refer to ["4.1 Overview - Oil Filter Bracket and Oil Cooler", page 164](#).

## 4 - Bolt

- 15 Nm + 1/4 (90 °) additional turn
- Always replace
- First, fasten upper left and lower right bolts, and then tighten all four bolts in a diagonal sequence

## 5 - Bracket

- For wiring harness

## 6 - Bolt

- 10 Nm

## 7 - Connection

- For the coolant thermostat

## 8 - Bolt

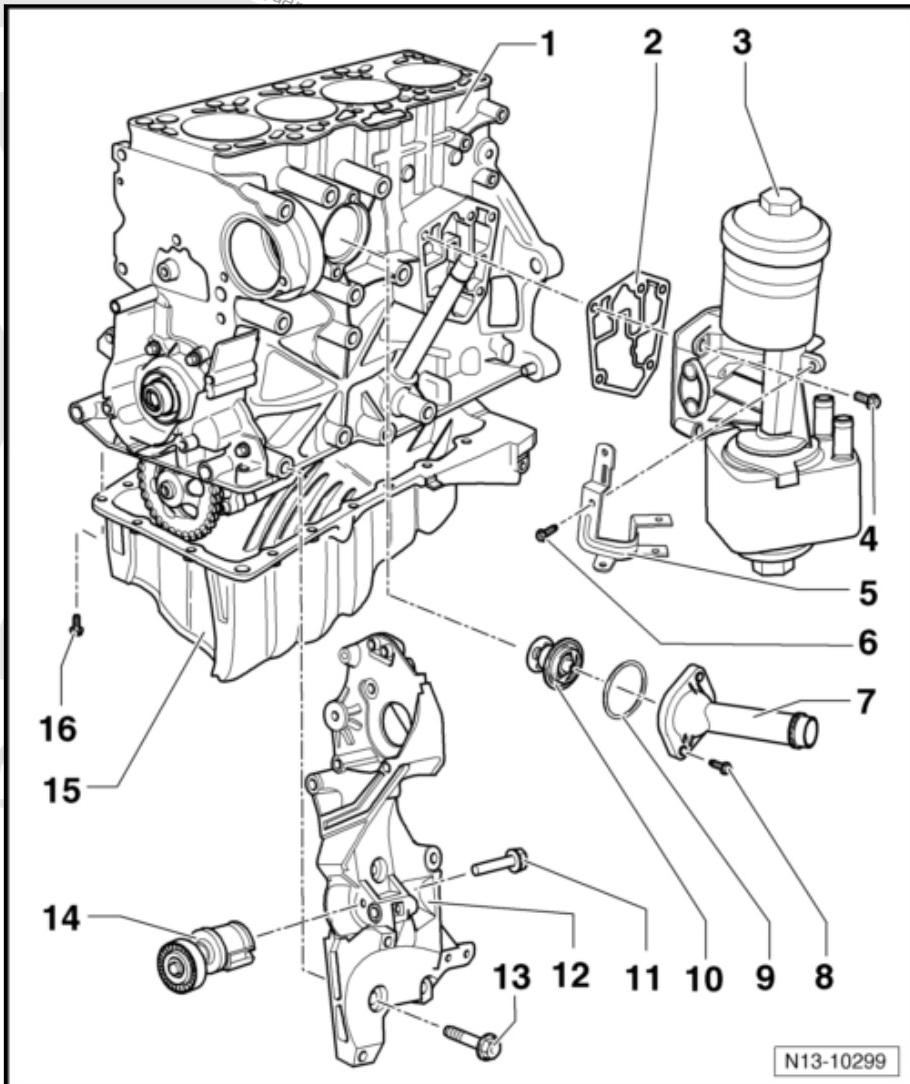
- 15 Nm

## 9 - O-Ring

- Always replace

## 10 - Coolant Thermostat

- Note the installation position. Refer to ["1.8 Coolant Thermostat, Removing and Installing", page 190](#), Coolant Thermostat, Removing and Installing
- Checking: warm the thermostat in a water bath
- Starts to open: approximately 85 °C (185 °F)
- Ends approximately 105 °C (221 °F)
- Opening lift minimum 7 mm



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- Coolant thermostat, removing and installing. Refer to ⇒ [“1.8 Coolant Thermostat, Removing and Installing”, page 190](#).
- 4/2-Way Valve with Thermostat, Removing and installing. Refer to ⇒ [“1.9 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 191](#).

#### 11 - Bolt

- 20 Nm + 1/2 (180 °) additional turn
- Always replace
- Do not lubricate or grease the threads and collar
- additional rotation can occur in several stages

#### 12 - Bracket

- For the sub-assembly
- Removing and installing. Refer to ⇒ [“1.5 Sub-Assembly Bracket, Removing and Installing”, page 45](#).

#### 13 - Bolt

- 40 Nm + 1/4 (90 °) additional turn
- Always replace

#### 14 - Ribbed Belt Tensioner

- To release the tension on ribbed belt, pivot using a open end wrench. Refer to ⇒ [“1.3 Ribbed Belt, Removing and Installing”, page 42](#).
- Removing and installing. Refer to ⇒ [“1.4 Ribbed Belt Tensioner, Removing and Installing”, page 43](#).

#### 15 - Oil Pan

- Clean sealing surface before installing
- Install with Silicone Sealant - D 176 404 A2-

#### 16 - Bolt

- 15 Nm
- Tighten diagonally in steps

### 1.3 Ribbed Belt, Removing and Installing

⇒ [“1.3.1 Removing”, page 42](#).

⇒ [“1.3.2 Installing”, page 43](#).

#### 1.3.1 Removing



##### Caution

If large quantities of metal shavings or abrasions are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent further damage, perform the following steps after the repair:

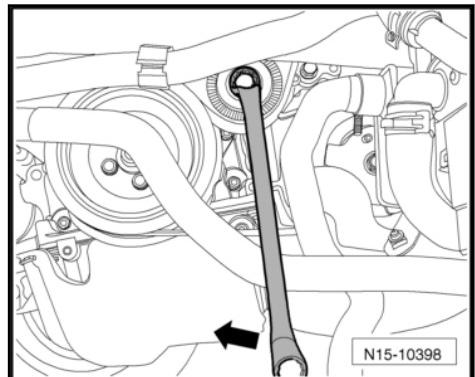
- ◆ Clean the oil channels carefully
- ◆ Replace the oil spray jets
- ◆ Replace the oil cooler
- ◆ Replace the oil filter.

#### Special tools and workshop equipment required

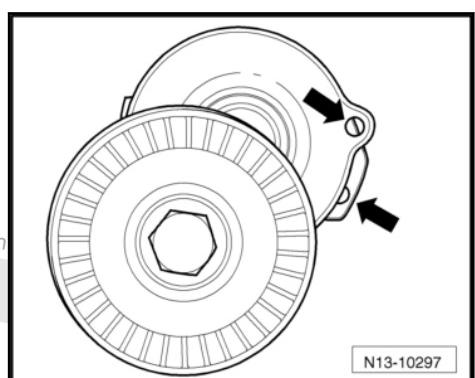
- ◆ Locking Pin - T10060A-
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
- Mark the ribbed belt running direction.



- Move the tensioner in the direction of the -arrow- to release the tension on the ribbed belt.



- Align the holes -arrows- to the cover and secure the tensioner with the - T10060A- .
- Remove the ribbed belt.



### 1.3.2 Installing

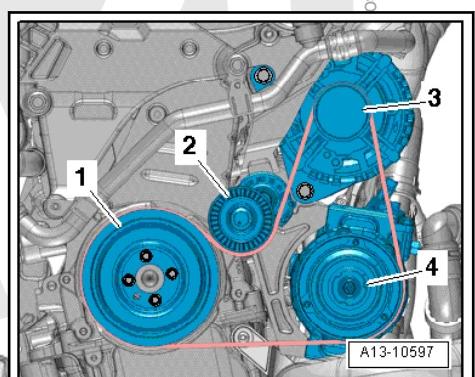
Install in reverse order of removal. Note the following:

- Secure the Generator - C- and A/C compressor before installing the ribbed belt.
- Note the previously marked direction of belt rotation and make sure that it is seated correctly on pulley.
- Install the ribbed belt on the ribbed belt pulley.

- 1 - Crankshaft
- 2 - Tensioner
- 3 - Generator
- 4 - A/C Compressor

After the belt is installed, always perform the following:

- Start the engine and check the running belt.



### 1.4 Ribbed Belt Tensioner, Removing and Installing



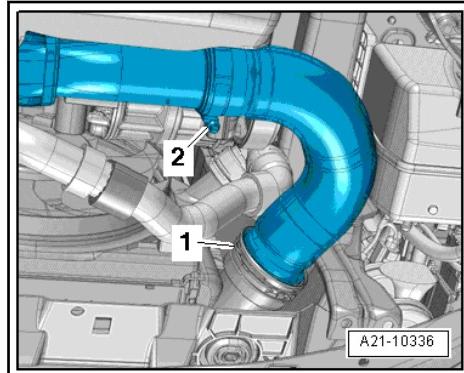
#### Caution

- ◆ Clean the oil channels carefully
- ◆ Replace the oil spray jets
- ◆ Replace the oil cooler
- ◆ Replace the oil filter.

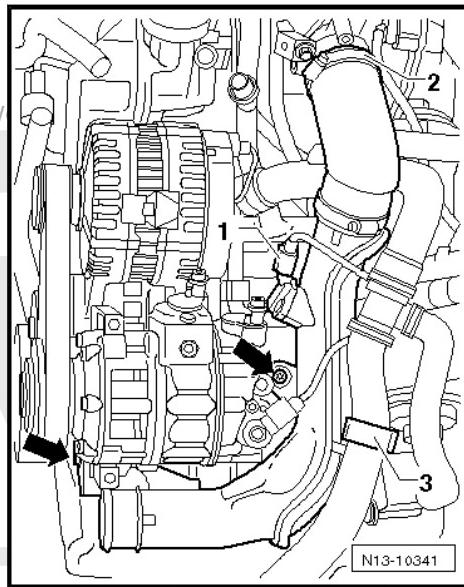


## Removing

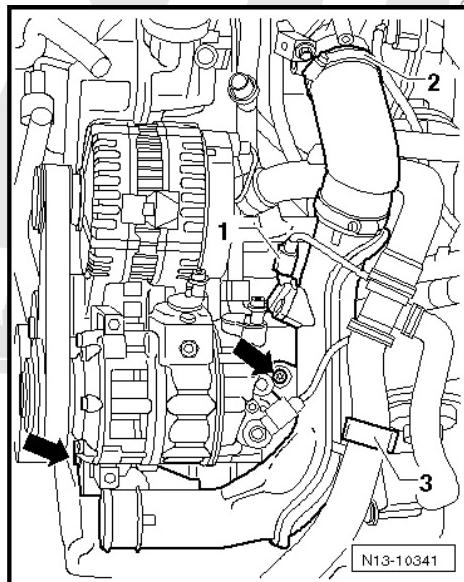
- Remove the ribbed belt. Refer to [“1.3 Ribbed Belt, Removing and Installing”, page 42](#).
- Loosen the clamp -2-, lift the clip -1- and remove the connecting hose »cold side«.
- Remove the air shroud with the Radiator Fan - V7- and Radiator Fan 2 - V177-. Refer to [“1.5 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 188](#).



- Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .



- Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.



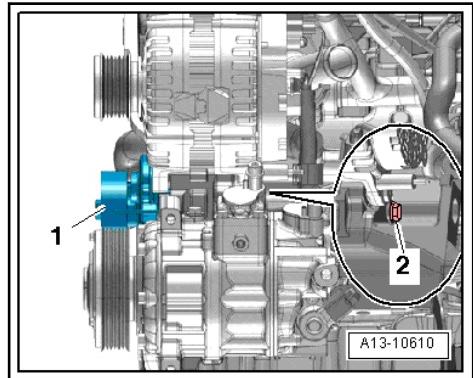


- Remove the bolt -2- and remove the ribbed belt tensioner -1-.

#### Installing

Install in reverse order of removal. Note the following:

- ◆ Replace the screw for the tensioner.
- ◆ Tightening specifications. Refer to [“1.1 Overview - Ribbed Belt Drive”, page 39](#).
- ◆ Install the ribbed belt. Refer to [“1.3 Ribbed Belt, Removing and Installing”, page 42](#).



## 1.5 Sub-Assembly Bracket, Removing and Installing



#### Caution

- ◆ Clean the oil channels carefully
- ◆ Replace the oil spray jets
- ◆ Replace the oil cooler
- ◆ Replace the oil filter.

#### Special tools and workshop equipment required

- ◆ Engine Support Bridge - 10-222A-

#### Removing

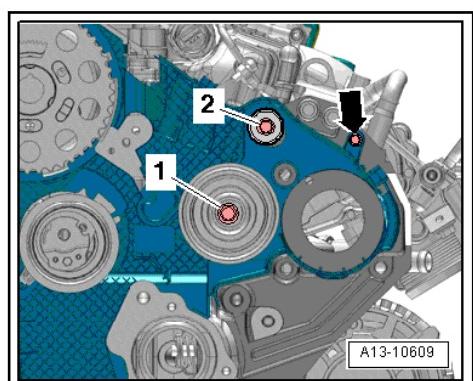
- Remove the engine bracket. Refer to [“1.6 Engine Bracket, Removing and Installing”, page 46](#).
- Remove the high pressure pump. Refer to [“3.9 High Pressure Fuel Pump, Removing and Installing”, page 301](#).
- Remove the generator. Refer to [Electrical Equipment; Rep. Gr. 27](#).



#### WARNING

*Do not open the A/C system refrigerant circuit.*

- Remove the A/C compressor from the sub-assembly bracket and secure it to the lock carrier.
- Remove the idler rollers -1 and 2- and remove the bolt on the toothed belt guard -arrow-.



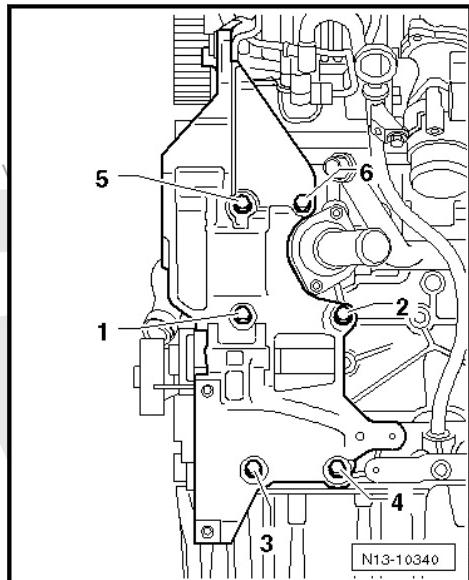


- Remove the bolts -6 to 1- and remove the sub-assembly bracket.

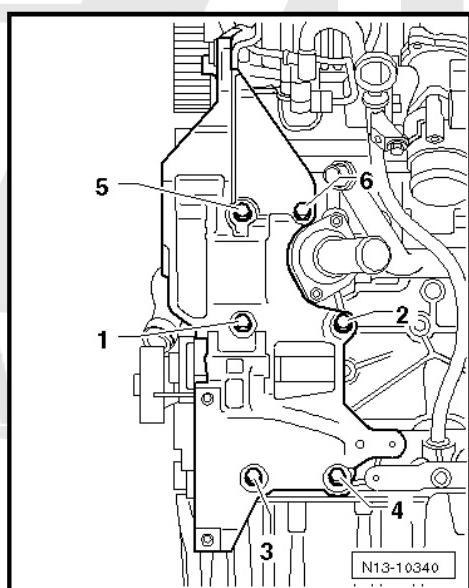
### Installing

Install in reverse order of removal. Note the following:

- ◆ Make sure there are alignment sleeves inside the sub-assembly bracket and replace any that are missing.
- ◆ Replace bolts, which have been tightened to torque.



- Tighten the bolts in sequence -1 to 6-. Tightening specification -Item 13- [⇒ Item 13 \(page 42\)](#).
- Install the generator. Refer to [⇒ Electrical Equipment; Rep. Gr. 27](#).
- Install the high pressure pump. Refer to [⇒ "3.9 High Pressure Fuel Pump, Removing and Installing", page 301](#).
- Install the engine bracket. Refer to [⇒ "1.6 Engine Bracket, Removing and Installing", page 46](#).



## 1.6 Engine Bracket, Removing and Installing



### Caution

- ◆ *Clean the oil channels carefully*
- ◆ *Replace the oil spray jets*
- ◆ *Replace the oil cooler*
- ◆ *Replace the oil filter.*



## Removing



### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

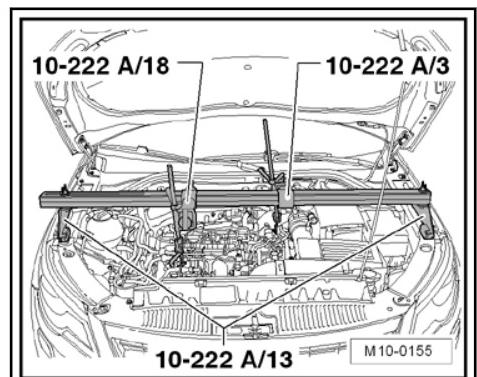
- ◆ *Route lines of all types (for example for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*

*There is a risk of breaking for work on or near the vehicle alignment.*

- Remove the engine cover. Refer to ⇒ [“1.6 Engine Cover, Removing and Installing”, page 87](#) .
- Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Loosen the spring clamps using the - VAS6362- .
- Remove the filler neck from the windshield and headlamp washer fluid reservoir. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Washer System; Washer Fluid Reservoir, Removing and Installing .
- Remove the coolant expansion tank from the body (the coolant lines remain connected).
- Remove the fuel filter (the fuel lines remain connected).
- Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66 ; Wheel Housing Liner .

### All Vehicles Except for Jetta from MY 2011.

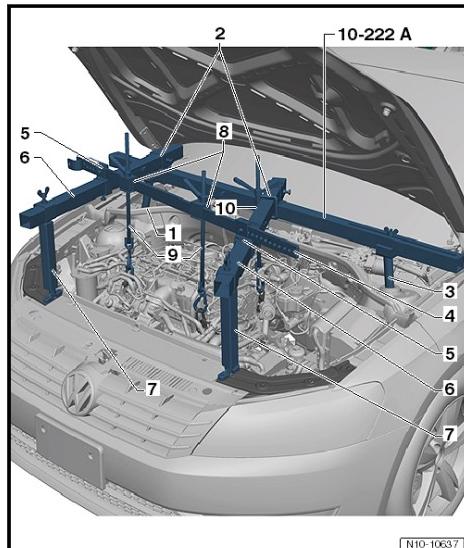
- Support the engine in the installation position. Refer to ⇒ [“2.3 Subframe Mount, Adjusting”, page 21](#) .





## Jetta from MY 2011

- Support the engine in the installation position. Refer to [“3.5 Engine, Supporting in Installation Position”, page 33](#).

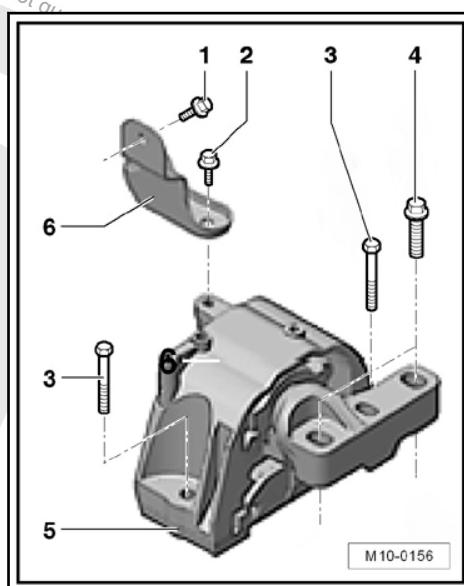


## Continuation for All Vehicles



### Note

- ◆ The subframe mount bolts may only be loosened when the engine is supported with the -10-222A-.
  - ◆ The engine bracket may only be loosened only when the engine mount is removed.
- Loosen the bolts -4- on the engine mount -5-.
  - Then remove the engine mount -5- bolts in the following sequence:
    1. Bolts -3-
    2. Bolts -1 and 2-
    3. Bolts -4-
  - Remove the engine mount -5-.



### WARNING

Make sure that no components/hoses are damaged, stretched or torn when lifting or lowering the engine using the -10-222A-.



### Note

The bolt -1- can be reached through an opening in the wheel housing. If necessary, raise and lower the engine with the spindle on the -10-222A- to remove or install the bolts -2 and 3-.

- Remove the engine bracket bolts in the sequence -3 to 1-.



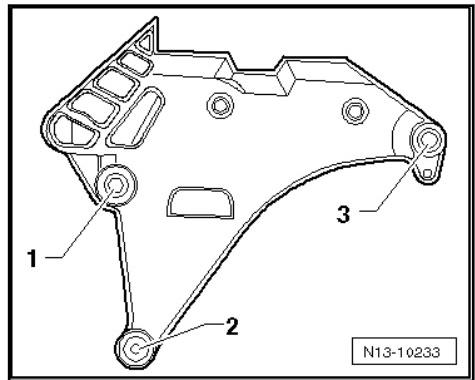
- Remove the engine bracket upward.

### Installing



#### Caution

*Always use the correct tightening sequence and specifications for the engine bracket bolts. Otherwise tension could develop in the engine bracket and break it.*



- Subframe mount tightening specifications. Refer to [“2 Subframe Mount, except Jetta from MY 2011”, page 18](#).
- Subframe mount tightening specifications. Refer to [“3 Assembly Mounts, Jetta from 2011”, page 25](#).

Install in reverse order of removal. Note the following:

- Install the engine bracket from above.

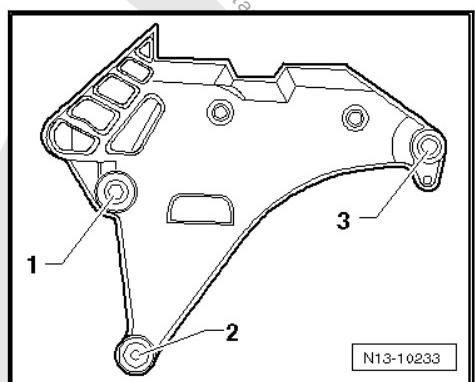


#### Note

*The bolt -1- can be reached through an opening in the wheel housing. If necessary, lift or lower the engine with the spindle for the -10-222A- to remove or install the bolts -2- and -3-.*

- Tighten the new bolts hand-tight in the sequence -1 to 3-.
- Tighten the bolts in the sequence -1 to 3- to the tightening specification -Item 3- [Item 3 \(page 26\)](#).
- Install the engine mount -5- and tighten the new bolts to the tightening specification in the following sequence:

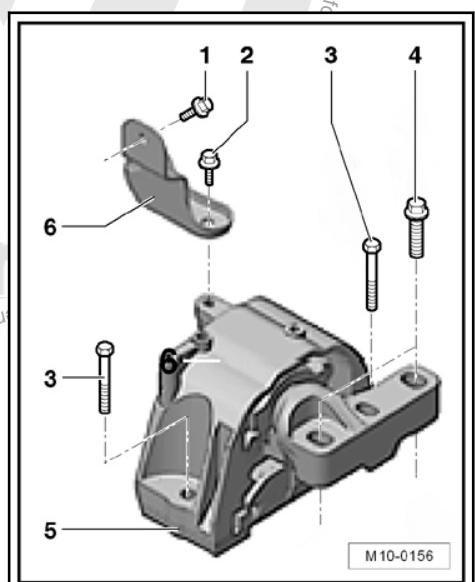
1. Bolts -3-
2. Bolts -1 and 2-
3. Using the spindle, bring the engine bracket into position on the engine mount -5-.



1. Tighten the bolts -4-.
- Checking the engine-subframe mount adjustment, except Jetta from MY 2011. Refer to [“2.2 Engine-Subframe Mount Adjustment, Checking”, page 21](#).
- Checking the engine-subframe mount adjustment, for Jetta MY from 2011. Refer to [“3.7 Subframe Mount, Checking Adjustment”, page 38](#).

Further installation is the reverse order of removal. Note the following:

- Check the fuel lines for secure fit.
- Do not interchange the supply and return lines (return lines are blue or have blue markings, supply lines are black).





## 2 Sealing Flange and Flywheel

- ⇒ “2.1 Overview - Sealing Flange and Flywheel”, page 50
- ⇒ “2.2 Crankshaft Sealing Flange, Removing and Installing”,  
page 52
- ⇒ “2.3 Crankshaft Seal, Replacing, Belt Pulley Side”, page 59
- ⇒ “2.4 Sealing Flange, Removing and Installing, Belt Pulley  
Side”, page 60
- ⇒ “2.5 Engine Speed Sensor G28 , Removing and Installing”,  
page 62

### 2.1 Overview - Sealing Flange and Flywheel

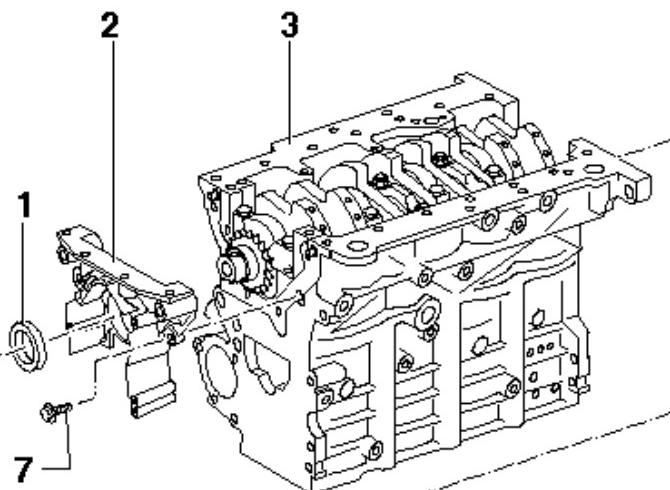
#### Servicing the Clutch:

- ◆ Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 30 .
- ◆ Vehicles with DSG® transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 30 .



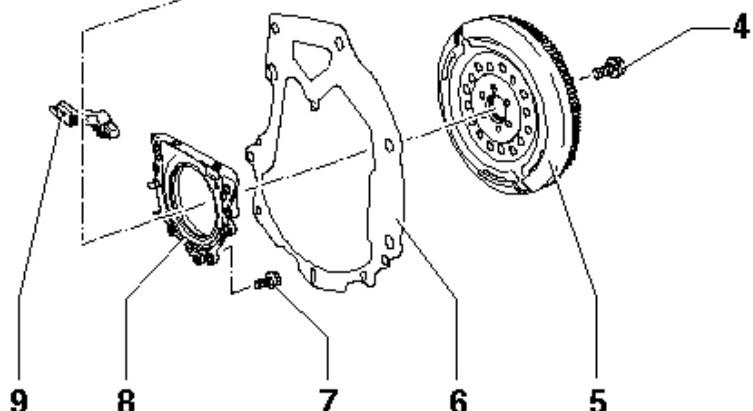
## 1 - Seal

- Do not coat the sealing lip on the seal with oil or grease
- Before installing, remove oil residue from crankshaft journal with a clean cloth
- Seal for crankshaft - belt pulley side- replacing. Refer to ["2.3 Crankshaft Seal, Replacing, Belt Pulley Side", page 59](#).



## 2 - Sealing Flange

- Must rest on the alignment sleeves
- Removing and installing. Refer to ["2.4 Sealing Flange, Removing and Installing, Belt Pulley Side", page 60](#).
- Insert with Silicone Sealant - D 176 404 A2-. Refer to ["2.4 Sealing Flange, Removing and Installing, Belt Pulley Side", page 60](#).



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## 3 - Cylinder Block

- Piston and connecting rod. Refer to ["3 Pistons and Connecting Rod", page 64](#).
- Crankshaft. Refer to ["4 Crankshaft", page 72](#).
- Engine code CBEA with balance shaft assembly
- Balance Shaft Assembly, Removing and installing. Refer to ["2 Lubrication System Components, Engine Code CBEA", page 140](#).

## 4 - Bolt

- $60 \text{ Nm} + \frac{1}{4} (90^\circ)$  additional turn
- Always replace

## 5 - Flywheel

- To loosen and tighten the bolts, secure the flywheel with the Flywheel Retainer - 3067-.

## 6 - Intermediate Plate

- Must rest on the alignment sleeves
- Be careful not to damage or bend when installing

## 7 - Bolt

- 15 Nm

## 8 - Sealing Flange with Seal

- With the Engine Speed Sensor - G28- sensor wheel
- Only replace completely
- Do not coat the sealing lip on the seal with oil or grease
- Before installing, remove oil residue from crankshaft journal with a clean cloth



- Use the support sleeve provided to install
- Removing and installing. Refer to ["2.2 Crankshaft Sealing Flange, Removing and Installing", page 52](#).

#### 9 - Engine Speed Sensor - G28-

- 5 Nm
- Removing and installing. Refer to ["2.5 Engine Speed Sensor G28 , Removing and Installing", page 62](#).

## 2.2 Crankshaft Sealing Flange, Removing and Installing

[⇒ , page 52](#)

[⇒ , page 53](#)

### Removing:

#### Special tools and workshop equipment required

- ◆ Seal Installer - Rear Crankshaft - T10134-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Open Ring Wrench - 24mm - VAG1332/11-
- ◆ Caliper gauge

- ◆ M6 x 35 mm hex bolts (quantity: 3)

- ◆ M7 x 35 mm hex bolts (quantity: 2)

### Remove the transmission:

- ◆ Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 ; Transmission, Removing and Installing .

- ◆ Vehicles with DSG® transmission. Refer to ⇒ 6-Speed DSG Transmission 02E; Rep. Gr. 34 ; Transmission, Removing and Installing .

- Remove the flywheel -Item 5- [⇒ Item 5 \(page 51\)](#) .
- Remove the intermediate plate -Item 6- [⇒ Item 6 \(page 51\)](#) .



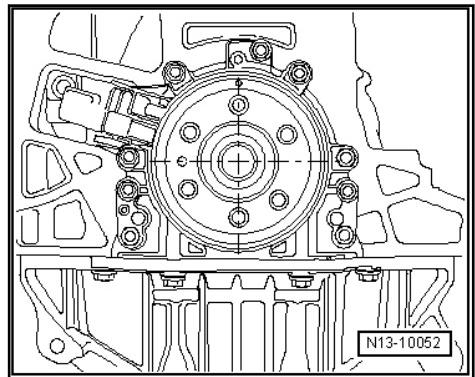


- Turn the crankshaft to cylinder 1 TDC as shown.

- Remove the oil pan:

Engine Code CBEA. Refer to [“2 Lubrication System Components, Engine Code CBEA”, page 140](#)

Engine Codes CJAA. Refer to [“3 Lubrication System Components, Engine Code CJAA”, page 157](#).



### Note

- ◆ To improve clarity, the work procedures will be shown with the engine removed.
- ◆ The work procedures are the same with the engine installed and the transmission removed.
- Remove the Engine Speed Sensor - G28-. Refer to [“2.5 Engine Speed Sensor G28 , Removing and Installing”, page 62](#).
- Remove the sealing flange bolts.

### Note

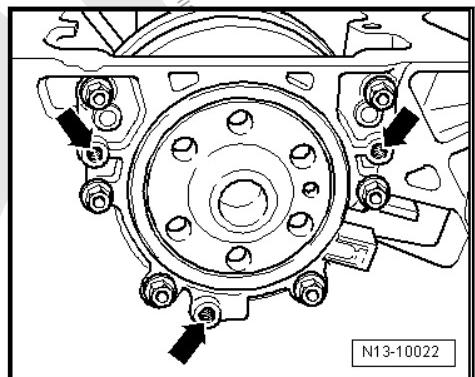
The sealing flange and sensor wheel are pressed together off the crankshaft with three M6 x 35 mm bolts.

- Install the three M6 x 35 mm bolts in the threaded holes on the sealing flange -arrows-.
- Screw the bolts (max. one 1/2 turn (180°) per bolt) into the sealing flange in an alternating sequence and press the sealing flange together with the sensor wheel off the crank-shaft.

### Installing:

### Note

- ◆ Sealing flange with PTFE-seal is equipped with a sealing lip support ring. This support ring serves the same function of a guide sleeve and must not be removed before installation.
- ◆ The sealing flange and sensor wheel must not be separated or rotated after being removed from the replacement part packaging.
- ◆ The sensor wheel retains the installation position via being located on the locating pin of the Seal Installer - Rear Crank-shaft - T10134-.
- ◆ The sealing flange and seal are one unit and may only be replaced together with the sensor wheel.
- ◆ The Seal Installer - Rear Crankshaft - T10134- retains the installation position to the crankshaft via a guide pin, which is guided into the hole of the crankshaft.



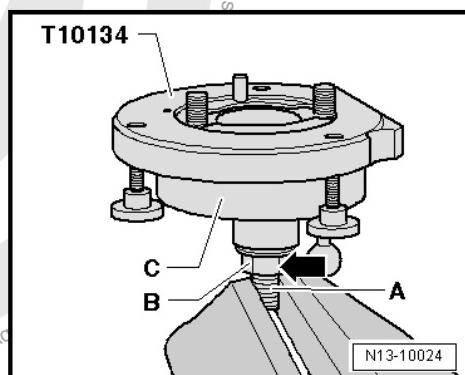
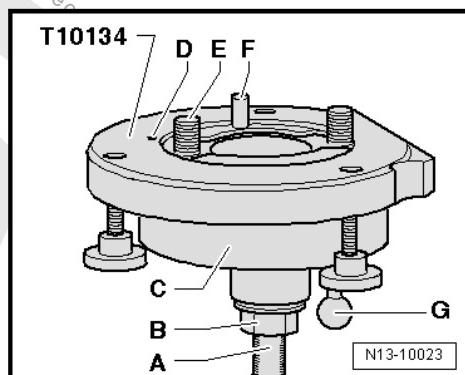
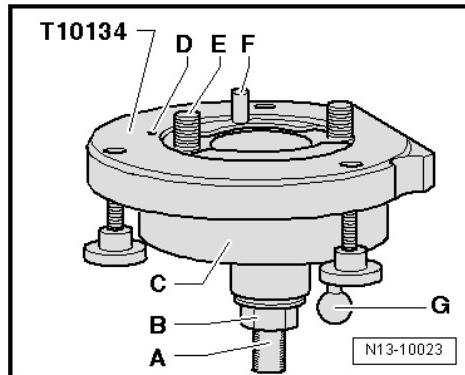


### Seal Installer - Rear Crankshaft - T10134-

- A - Tension Surface
- B - Hex Nut
- C - Assembly Bell
- D - Locating Pin
- E - Hex Socket Bolt
- F - Guide Pin for Diesel Engines (Black Handle)
- G - Guide Pin for Gasoline Engines (Red Handle)

#### A - Installing the Gasket with Sensor Wheel on the Seal Installer - Rear Crankshaft - T10134-

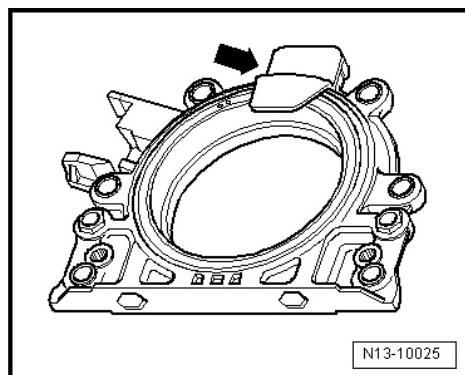
- Screw on the nut -B- until shortly before the tension surface -A- of the threaded spindle.
- Tension the Seal Installer - Rear Crankshaft - T10134- in a vise on the tension surface -A- of the threaded spindle.
- Push the assembly bell -C- downward so that it rests on the hex nut -B- [arrow].
- Install the hex nut on the threaded spindle until the inner section of the assembly tool is level with the assembly bell.



- Remove the securing clip -arrow- from the new sealing flange.

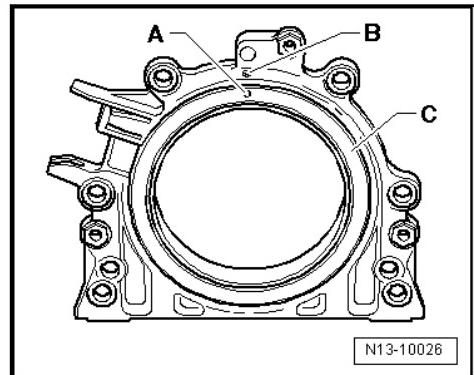


*The sensor wheel must not be removed from or rotated in the sealing flange.*



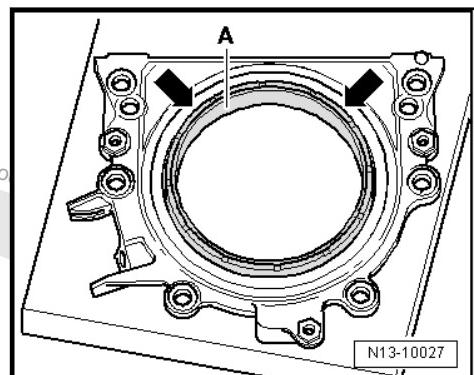


- The locating pin -A- on the sensor wheel -C- must align with the marking -B- on the sealing flange.
- Place the front side of the sealing flange onto a clean level surface.



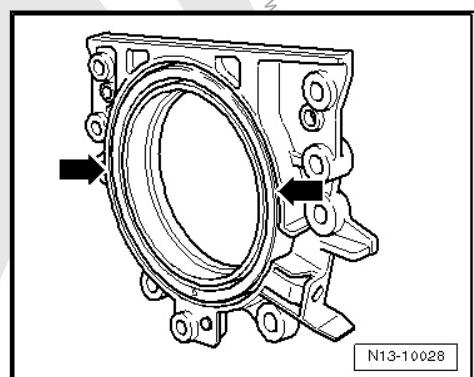
N13-10026

- Press the sealing lip support ring -A- in the direction of -arrow- until it rests on the level surface.



N13-10027

- The upper edge of the sensor wheel and the front edge of the sealing flange must align -arrows-.



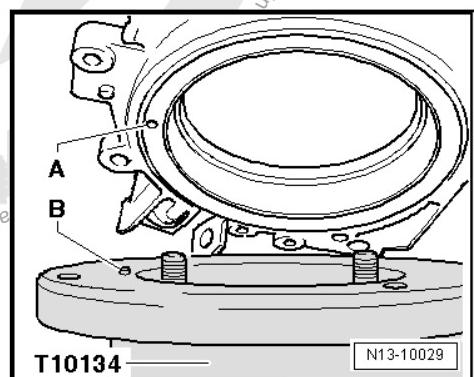
N13-10028

- Place the front side of the sealing flange on the -T10134- so the locating pin -B- is positioned in the hole -A- on the sensor wheel.



#### Note

*Make sure the sealing flange is positioned flat on the seal installer.*



T10134

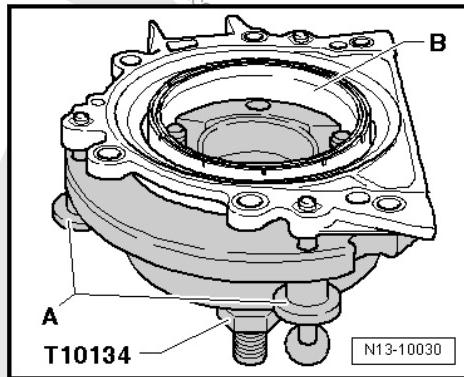
N13-10029



- Press the sealing flange and the sealing lip support ring -B- onto the surface of the -T10134- while tightening the three knurled bolts -A- so that the locating pin cannot slip out of the sensor wheel hole.

**Note**

*Make sure the sensor wheel remains fixed inside the assembly tool when installing the sealing flange.*



**B - Installing the -T10134- with Sealing Flange on the Crank-shaft Flange**

**Requirements**

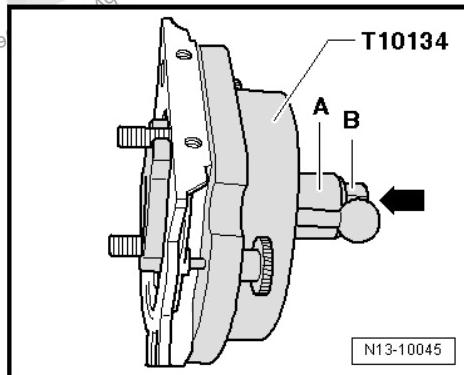
- Crankshaft flange must be free of oil and grease.
- The engine is at cylinder 1 TDC.

**Procedure**

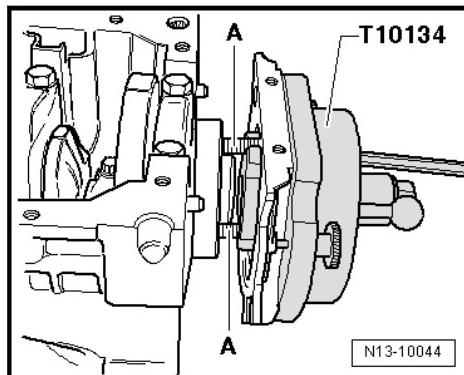
- Screw the hex nut -B- to the end of the threaded spindle.
- Push the threaded spindle on the -T10134- in the direction of -arrow- until the hex nut -B- rests on the assembly bell -A-.
- Position the flattened side of the assembly bell toward the oil pan side of the cylinder block sealing surface.

**Note**

*Screw the hex socket bolts -A- approximately five threads into the crankshaft flange.*



- Secure the -T10134- onto the crankshaft flange using the hex socket bolts -A-.





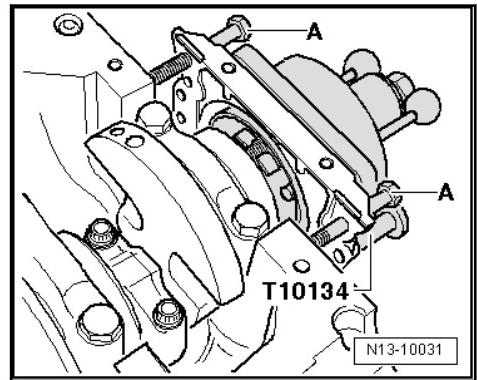
- Screw two M7 x 35 mm bolts -A- to guide the sealing flange into the cylinder block.

### C - Attaching the -T10134- to the Crankshaft Flange

- Push the assembly bell -C- by hand in the direction of -arrow- until the sealing lip support ring -B- rests on the crankshaft flange -A-.
- Push the guide pin for diesel engines (black handle) -D- into the crankshaft hole. Thereby the sensor wheel is retained in the final installation position.



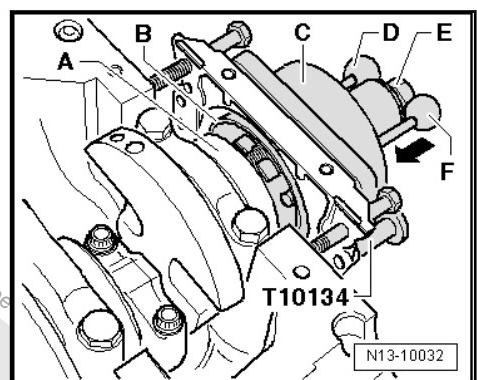
*Do not insert the guide pin for gasoline engines (red handle) -F- into the crankshaft threaded hole.*



- Hand-tighten both hex socket bolts on the Seal Installer - Rear Crankshaft .

- Install the nut -E- onto the threaded spindle by hand, until it rests on the assembly bell -C-.

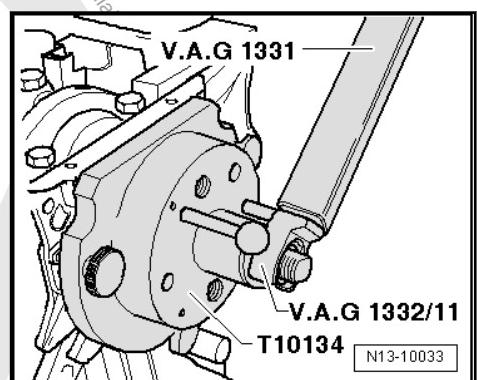
### D - Installing the Sensor Wheel on the Crankshaft Flange with the -T10134- .



- Tighten the hex nut on the -T10134- using a -VAG1331- and -VAG1332/11- .
- Tightening specification: 35 Nm



*After tightening the hex nut to 35 Nm, a minimal air gap must still be present between the cylinder block and sealing flange.*



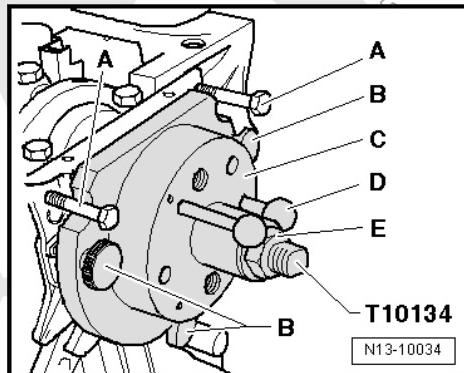
### E - Checking the Sensor Wheel Installation Position on the Crankshaft

- Screw the hex nut -E- to the end of the threaded spindle.
- Remove the two bolts -A- from the cylinder block.
- Remove the three knurled bolts -B- from the sealing flange.
- Remove the -T10134- .

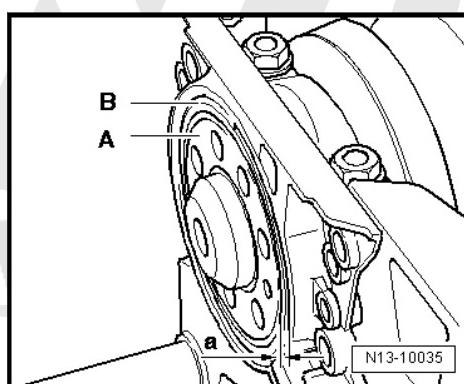




- Remove the sealing lip support ring.



The installed position of the sensor wheel on the crankshaft is exact, if a gap -a- of 0.5 mm is present between the crankshaft flange -A- and sensor wheel -B-.



- Set a caliper gauge onto the crankshaft flange.
- Measure the gap -a- between the crankshaft flange and sensor wheel.

If the dimension -a- is too small:

- Press the sensor wheel again. Refer to [page 58](#).

If dimension -a- is obtained:

- Tighten the new sealing flange bolts alternating in a diagonal sequence:
  - Tightening specification -Item 7- [⇒ Item 7 \(page 51\)](#).
  - Install the Engine Speed Sensor - G28-. Refer to [⇒ "2.5 Engine Speed Sensor G28, Removing and Installing", page 62](#).
- Install the oil pan:

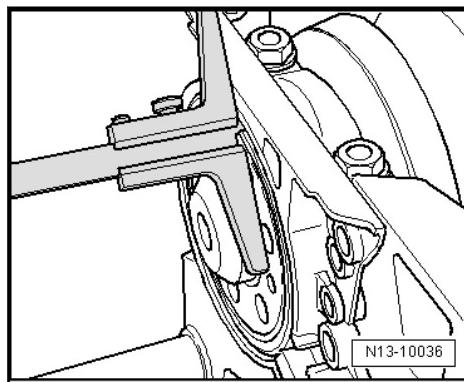
Engine Code CBEA. Refer to [⇒ "2 Lubrication System Components, Engine Code CBEA", page 140](#)

Engine Codes CJAA. Refer to [⇒ "3 Lubrication System Components, Engine Code CJAA", page 157](#).

- Install the intermediate plate -Item 6- [⇒ Item 6 \(page 51\)](#).
- Install the flywheel with new bolts:
  - Tightening specification -Item 4- [⇒ Item 4 \(page 51\)](#).

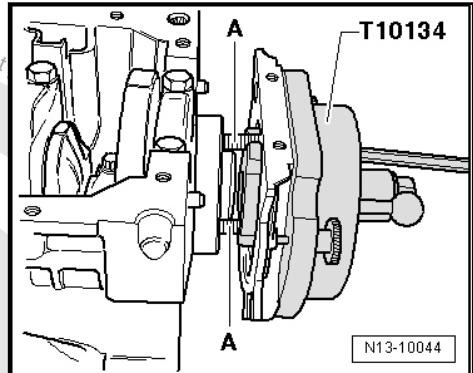
#### F - Pressing in the Sensor Wheel

- Secure the -T10134- onto the crankshaft flange using the hex socket bolts -A-.
- Hand-tighten both hex socket bolts -A-.

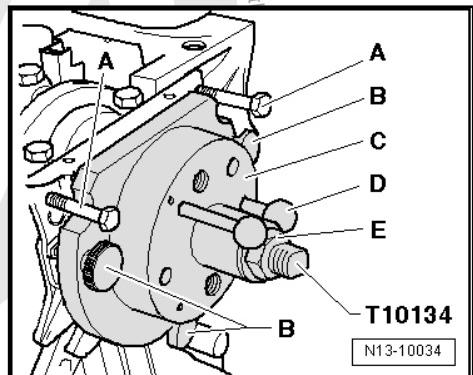




- Push the -T10134- onto the sealing flange by hand.



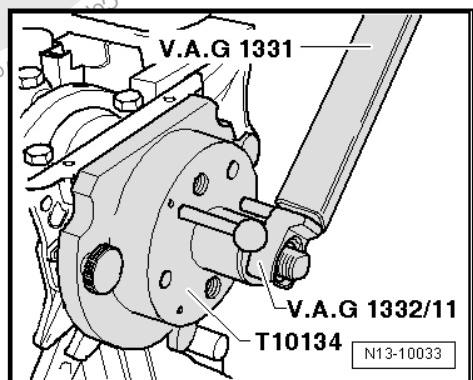
- Install the nut -E- onto the threaded spindle by hand, until it rests on the assembly bell -C-.



- Tighten the hex nut on the -T10134- using a -VAG1331- and -VAG1332/11- .
- Tightening specification: 40 Nm
- Check the installed position of the sensor wheel on the crankshaft again. Refer to [page 57](#) .

If dimension -a- is too small:

- Tighten the nut on the -T10134- :
- Tightening specification: 45 Nm
- Check the installed position of the sensor wheel on the crankshaft again. Refer to [page 57](#) .



## 2.3 Crankshaft Seal, Replacing, Belt Pulley Side

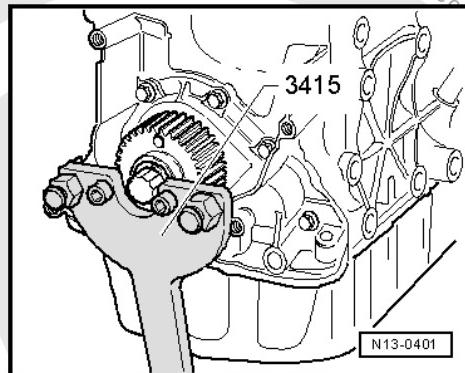
**Removing:**

### Special tools and workshop equipment required

- ◆ Puller - Crankshaft Seal - 3203-
- ◆ Counterhold - Crankshaft Sprocket - 3415-
- ◆ Seal Installer - Crankshaft Seal - T10053-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- Remove the toothed belt. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#) .



- Remove the crankshaft toothed belt sprocket. Secure the toothed belt sprocket with the - 3415- .
- To guide the -3203- , install the center bolt by hand into the crankshaft all the way.
- Turn the inner section of the -3203- two turns (approximately 3 mm) out from the outer section and lock it with the knurled bolt.
- Lubricate the threaded head on the -3203- .
- Install the seal puller as far as possible into the seal.



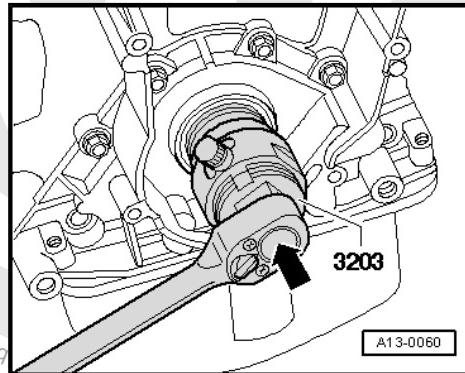
- Loosen the knurled bolt and turn the inner section against the crankshaft until the seal is pulled out.

#### Installing:

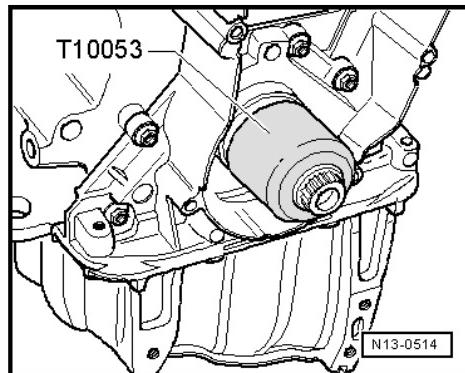
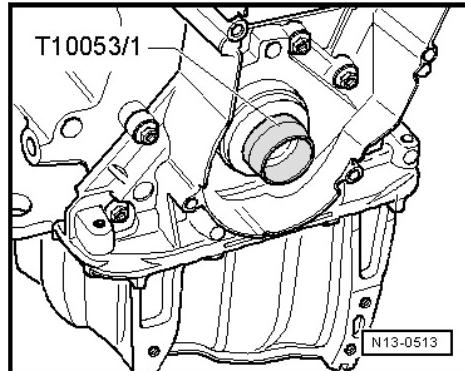


*The sealing lip of the seal may not be additionally oiled or greased.*

- Wipe off any oil that may still be on the end of the crankshaft with a clean cloth.
- Place -T10053/1- on the crankshaft journal.
- Push the seal over the Guide Sleeve onto the crankshaft journal.



- Press the seal in all the way with the -T10053- and the center bolt.
- Install the crankshaft toothed belt sprocket:
  - Tightening specification -Item 2- [Item 2 \(page 82\)](#) .
  - Installing and tensioning the toothed belt. Refer to ["1.8 Toothed Belt, Removing, Installing and Tensioning"](#), page 92 .



## 2.4 Sealing Flange, Removing and Installing, Belt Pulley Side

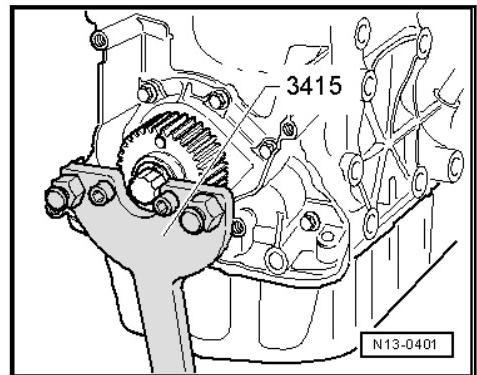
### Removing

#### Special tools and workshop equipment required

- ◆ Counterhold - Crankshaft Sprocket - 3415-



- ◆ Seal Installer - Crankshaft Seal - T10053-
  - ◆ Torque Wrench 1331 5-50Nm - VAG1331-
  - ◆ Torque Wrench 1332 40-200Nm - VAG1332-
  - ◆ Not illustrated
  - ◆ Hand Drill with Plastic Brush Attachment
  - ◆ Protective Eyewear
  - ◆ Flat-Blade Scraper
  - ◆ Silicone Sealant - D 176 404 A2-
  - Remove the toothed belt. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#).
  - Remove the crankshaft toothed belt sprocket. Secure the toothed belt sprocket with the -3415- .
  - Remove the oil pan:
- Engine Code CBEA. Refer to [“2 Lubrication System Components, Engine Code CBEA”, page 140](#)
- Engine Codes CJAA. Refer to [“3 Lubrication System Components, Engine Code CJAA”, page 157](#).
- Remove the sealing flange belt pulley side.
  - Remove the sealing flange. If necessary, loosen it by tapping lightly with a rubber mallet.
  - Remove the sealant residue from cylinder block with a flat-blade scraper.



#### WARNING

*Wear protective eyewear.*

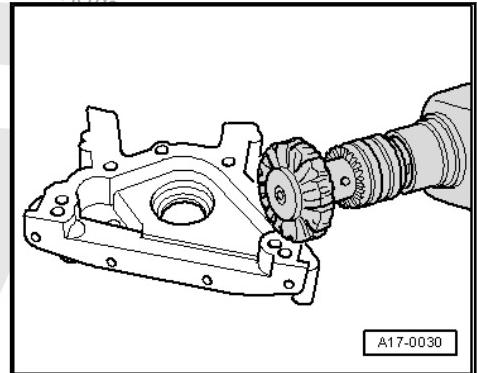
- Remove sealant residue from sealing flange using a rotating plastic brush (wear safety glasses).
- Clean the sealing surfaces. They must be free of oil and grease.

#### Installing:



#### Note

- ◆ Note the expiration date for the Sealant .
- ◆ The sealing flange must be installed within five minutes after applying the Silicone Sealant .

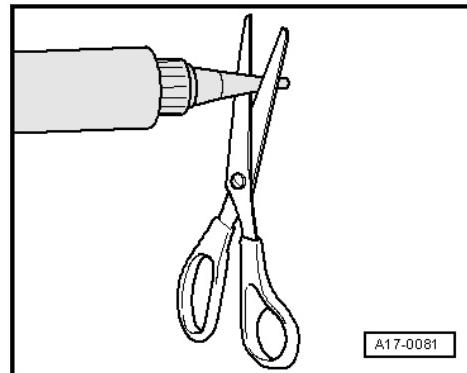




- Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).

Note

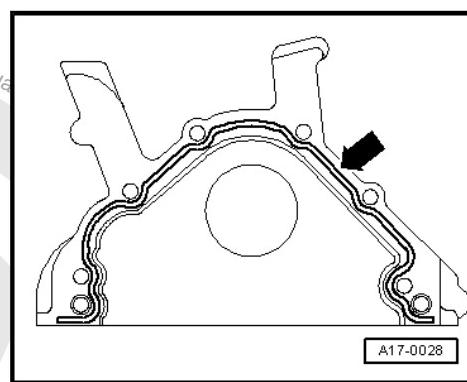
- ◆ *The sealant bead must not be thicker than 2 to 3 mm.*
- ◆ *Otherwise the extra sealant will get into the oil pan and can block the screen in the oil pump suction line.*
- ◆ *The sealant also must not drip onto the crankshaft seal sealing surface.*
- ◆ *Before applying the bead of sealant, cover the sealing surface on the seal with a clean cloth*



- Apply a silicone sealant bead to the sealing surface of the sealing flange as shown.
- Install the sealing flange immediately and tighten all bolts lightly.

Note

*Use -T10053/1- to position the sealing flange on the installed seal.*



- Tighten the sealing flange bolts in a diagonal sequence:
  - Tightening specification -Item 7- [Item 7 \(page 51\)](#) .
  - Install the crankshaft toothed belt sprocket:
    - Tightening specification -Item 2- [Item 2 \(page 82\)](#) .
  - Install the oil pan:
    - Engine Code CBEA. Refer to [“2 Lubrication System Components, Engine Code CBEA”, page 140](#)
    - Engine Codes CJAA. Refer to [“3 Lubrication System Components, Engine Code CJAA”, page 157](#) .

Note

*After assembly, allow the Sealant to dry for approximately 30 minutes. Only afterward may the engine oil be replenished.*

- Installing and tensioning the toothed belt. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#) .

## 2.5 Engine Speed Sensor - G28- , Removing and Installing

### Removing:

#### Special tools and workshop equipment required

- ◆ Hose Clamps - Up To 25 mm - 3094-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Hose Clip Pliers - VAS6362-



- ◆ Hex Socket - 4mm - T10370-

### Conditions

- Engine must be cold.

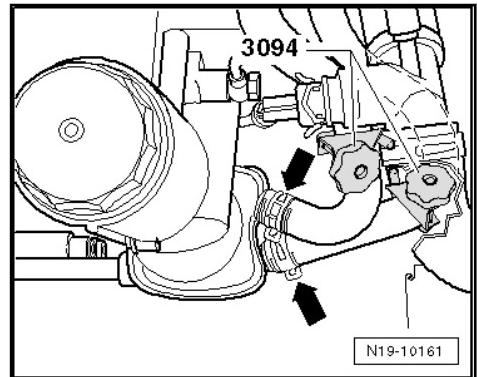
### Procedure

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
- Clamp off the coolant hoses from the oil cooler using -3094- .
- Loosen the spring clamps -arrows- using the -VAS6362- .



*Catch leaking coolant with the -VAS6208- .*

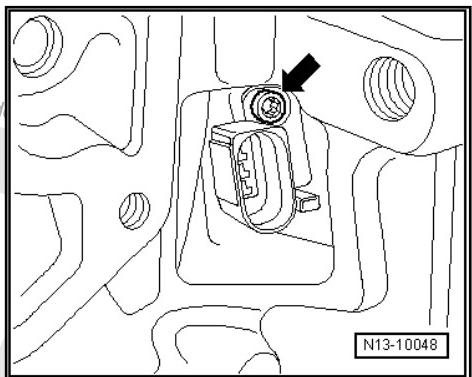
- Disconnect the coolant hoses from the oil cooler.
- Remove the oil filter bracket. Refer to ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 164 .
- Remove the bolt -arrow- with Hex Socket - 4mm - T10370- and the Engine Speed Sensor - G28- .



### Installing:

Install in reverse order of removal. Note the following:

- Engine Speed Sensor - G28- tightening specification -Item 9- [⇒ Item 9 \(page 52\)](#) .
- Oil filter bracket tightening specifications. Refer to ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 164 , Overview - Oil filter Bracket and Oil Cooler
- Check the coolant level and fill if necessary. Refer to ⇒ “1.10 Coolant, Draining and Filling”, page 192 .





### 3 Pistons and Connecting Rod

- ⇒ [“3.1 Overview - Piston and Connecting Rod”, page 64](#)
- ⇒ [“3.2 Pistons, Removing and Installing”, page 68](#)
- ⇒ [“3.3 New Connecting Rod, Separating”, page 69](#)
- ⇒ [“3.4 Bearing Shells - Installation Position”, page 70](#)
- ⇒ [“3.5 Piston and Cylinder Dimensions”, page 70](#)
- ⇒ [“3.6 Piston Projection in Top Dead Center \(TDC\), Checking”, page 71](#)

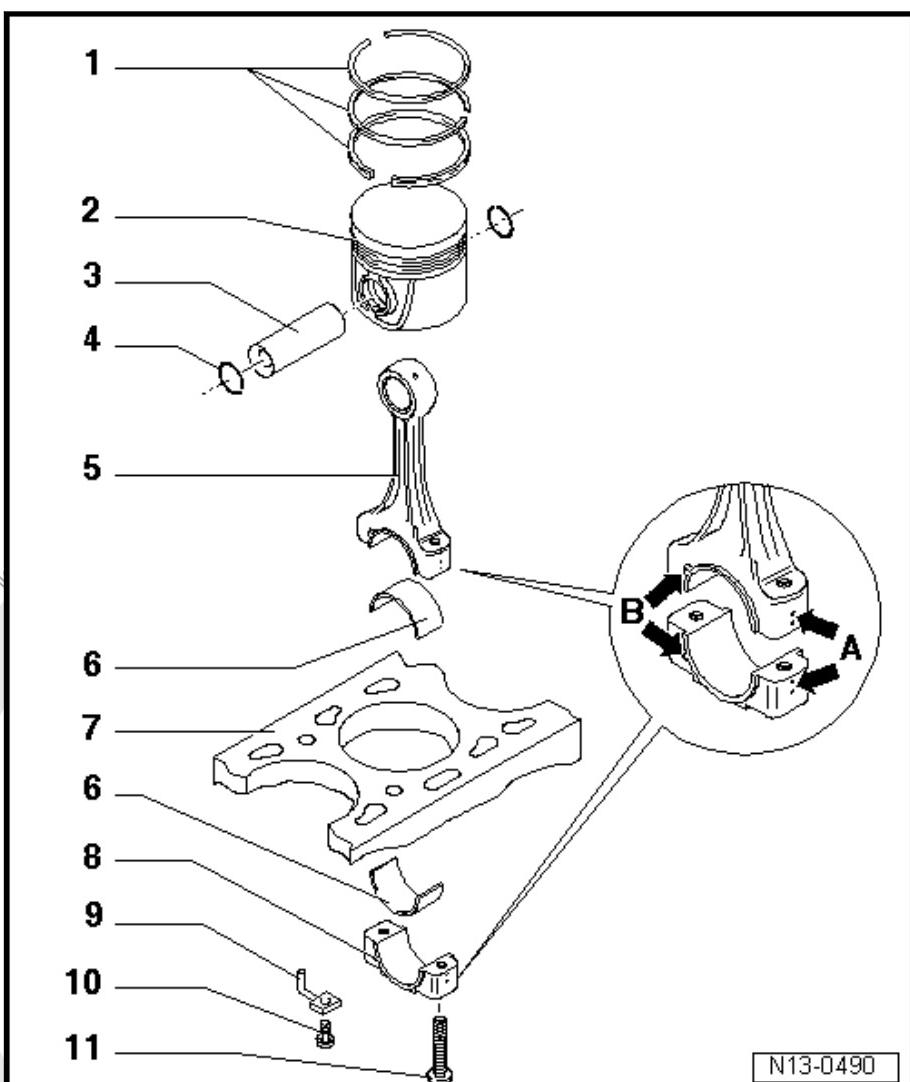
#### 3.1 Overview - Piston and Connecting Rod





## 1 - Piston Rings

- Offset gaps by 120°
- Use piston ring pliers for removing and installing
- "TOP" identification faces toward piston crown
- Checking the ring gap. Refer to [Fig. "Checking the Piston Ring Gap"](#), page 66 .
- Checking the groove clearance. Refer to [Fig. "Piston Ring Groove Clearance, Checking"](#), page 67 .



## 2 - Piston

- With the internal combustion engine
- Mark the installed position and cylinder allocation
- Installed position and allocation, piston/cylinder. Refer to [Fig. "Installed Position of Piston and Piston/Cylinder Allocation"](#), page 68 .
- Arrow on piston crown points toward belt pulley side
- Install with piston ring compressor
- Replace the piston if the piston shaft is cracked
- Check the piston projection in TDC. Refer to ["3.6 Piston Projection in Top Dead Center \(TDC\), Checking"](#), page 71 .
- Removing and installing. Refer to ["3.2 Pistons, Removing and Installing"](#), page 68

## 3 - Piston Pin

- If difficult to move, heat piston to 60 °C (140 °F)
- Remove and install using the Pilot Drift - VW222A-

## 4 - Circlip

## 5 - Connecting Rod

- Label the allocation to the cylinder using a color marker -A-
- Installation position: the marks -B- face the belt pulley side
- With cracked bearing cap
- New connecting rod, disconnecting. Refer to ["3.3 New Connecting Rod, Separating"](#), page 69 .

## 6 - Bearing Shell

- Note the installation position Refer to ["3.4 Bearing Shells - Installation Position"](#), page 70 .
- Pay attention to the version: upper bearing shell (facing the piston) is made from wear resistant material; characteristic: a black line on the running surface near the separating point
- Do not interchange used bearing shells.
- Insert bearing shells in the center



- Check for secure fit
- Axial play wear limit: 0.37 mm
- Measure the radial play with Plastigage®: wear limit: 0.08 mm
- Do not turn the crankshaft when measuring radial clearance

## 7 - Cylinder Block

- Checking the cylinder bore. Refer to [Fig. "Cylinder Bore, Checking"](#), page 67.
- Pistons and cylinder dimensions. Refer to ["3.5 Piston and Cylinder Dimensions"](#), page 70.

## 8 - Connecting Rod Bearing Cap

- Note the installation position
- Label the allocation to the cylinder using a color marker -A-
- Installation position: the marks -B- face the belt pulley side
- Due to the separation procedure (cracking) of the connecting rod, the connecting rod bearing cap only fits in one position and only to the corresponding connecting rod.

## 9 - Oil Spray Jet

- For piston cooling

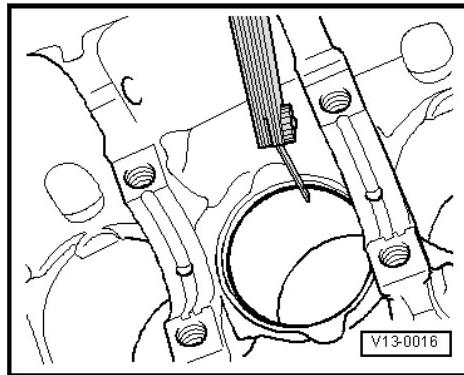
## 10 - Bolt with Pressure Relief Valve

- 27 Nm
- Install without sealant

## 11 - Connecting Rod Bolt

- 30 Nm + 1/4 (90°) additional turn
- Always replace
- Lubricate the threads and contact surface.
- Use the old bolt to measure the radial clearance

## Checking the Piston Ring Gap



## Special tools and workshop equipment required

- ◆ Feeler Gauge

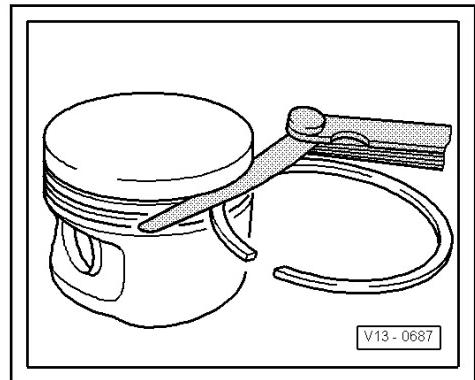
## Procedure

- Push the piston ring squarely from above down to approximately 15 mm from edge of the cylinder.

Piston Ring	Ring Gap	
Dimensions in mm	New	Wear limit
1. Compression ring	0.20 to 0.40	1.0
2. Compression ring	0.20 to 0.40	1.0
Oil Scraping Ring	0.25 to 0.50	1.0



## Piston Ring Groove Clearance, Checking



V13-0687

### Special tools and workshop equipment required

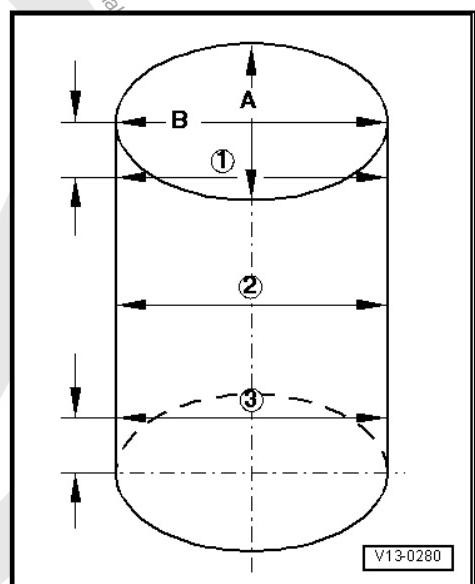
- ◆ Feeler Gauge

### Procedure

- Clean the ring groove before checking.

Piston Ring	Ring to Groove Clearance	
Dimensions in mm	New	Wear limit
1. Compression ring	0.06 to 0.09 <sup>not guaranteed or accepted any longer</sup>	0.25
2. Compression ring	0.05 to 0.08	0.25
Oil Scraping Ring	0.03 to 0.06	0.15

## Cylinder Bore, Checking



V13-0280

### Special tools and workshop equipment required

- ◆ Inner measuring device 50 to 100 mm

### Procedure

- Measure bores at three locations diagonally transversely -A- and lengthwise -B- in line with crankshaft.
- Deviations to the specified size: maximum 0.10 mm

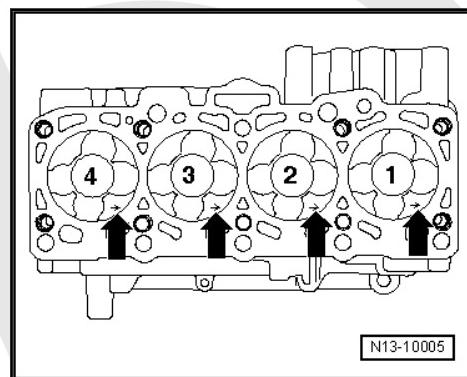


### Note

The cylinder bore must not be measured when the cylinder block is mounted in the -VAS6095A- because the measurements may be incorrect.

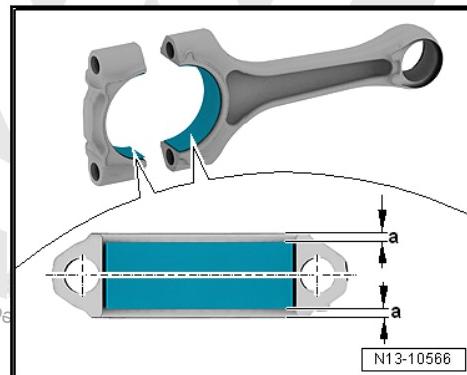
#### Installed Position of Piston and Piston/Cylinder Allocation

The arrow on the piston crown -arrows- points toward the belt pulley side.



#### Installation Position of the Bearing Shells in the Connecting Rods

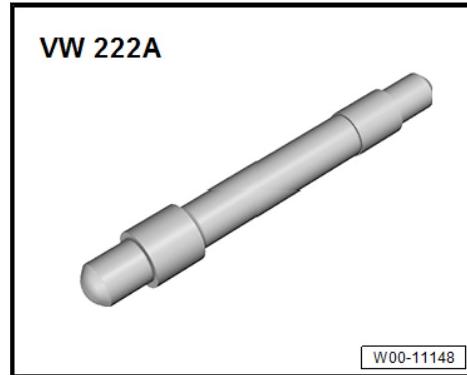
- Insert the bearing shells in the middle of the connecting rod and the connecting rod bearing cap.
- Measurement -a- = 2.5 mm.



## 3.2 Pistons, Removing and Installing

### Special tools and workshop equipment required

- ◆ Pilot Drift - VW222A-



- ◆ Commercially Available Piston Ring Compressor

### Removing

- Remove the cylinder head. Refer to ["1.9 Cylinder Head, Removing and Installing", page 99](#).

### Engine Codes CBDA, CBDB, CEGA, CJAA

- Remove the oil pump. Refer to ["3.3 Oil Pump, Removing and Installing", page 162](#).

### Engine Codes CBEA

- Remove balance shaft assembly. Refer to ["2.4 Balance Shaft Assembly, Removing and Installing", page 146](#).

### Continue for All Vehicles

- Mark the installation position and the connecting rod bearing cap allocation to the cylinder and connecting rod for installing again later. Refer to -item 8- ["Item 8 \(page 66\)"](#).



- Remove the connecting rod bearing cap.
- Remove the piston with the connecting rod upward.

**Note**

*Warm the piston to approximately 60 °C (140 °F) if it is difficult to move the piston pin.*

- Remove the circlip from the piston pin eye.
- Remove the piston pin using the Pilot Drift - VW222A- .

**Installing**

Install in the reverse order of removal while noting the following:

**Note**

*Replace the bolts that were tightened with an additional turn.*

- Coat the contact surfaces on the bearing shells with oil.
- Install the piston with the piston ring compressor.

Installation position:

- Piston. Refer to [Fig. “Installed Position of Piston and Piston/Cylinder Allocation”](#), page 68 .
- Bearing shells in the connecting rod. Refer to [Fig. “Installation Position of the Bearing Shells in the Connecting Rods”](#), page 68 .
- Install the connecting rod bearing cap according to the marking.

**Engine Codes CBDA, CBDB, CEGA, CJAA**

- Install the oil pump. Refer to [“3.3 Oil Pump, Removing and Installing”](#), page 162

**Engine Codes CBEA**

- Install balance shaft assembly. Refer to [“2.4 Balance Shaft Assembly, Removing and Installing”](#), page 146

**Continue for All Vehicles**

- Install the cylinder head. Refer to [“1.9 Cylinder Head, Removing and Installing”](#), page 99 .

**Tightening Specifications**

- ◆ Refer to [“3.1 Overview - Piston and Connecting Rod”](#), page 64

### 3.3 New Connecting Rod, Separating

New connecting rods might not be completely separated at the predetermined breaking point. If it is difficult to remove the connecting rod bearing cap by hand, do the following:

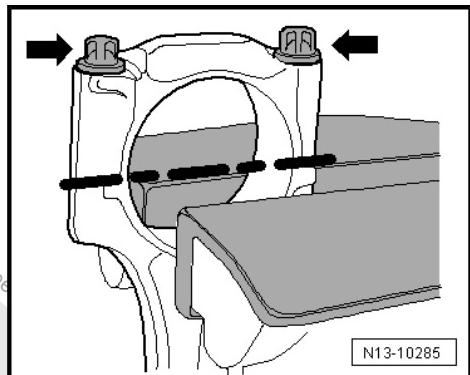
- Mark which cylinder belongs to the connecting rod.
- To prevent damage, only clamp the connecting rod lightly in a vise with protective covers over the jaws as shown.



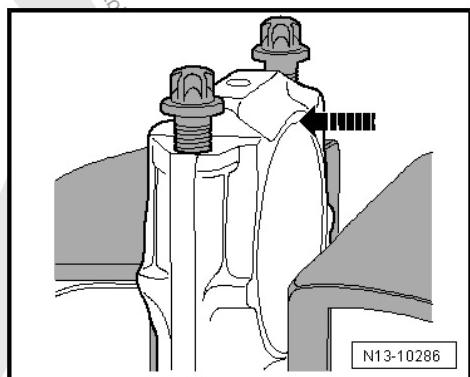
Note

Clamp the connecting rod below the dotted line.

- Remove the bolts -arrows- approximately five turns.



- Carefully tap the connecting rod bearing cap with a plastic hammer in direction of -arrow- until it comes loose.



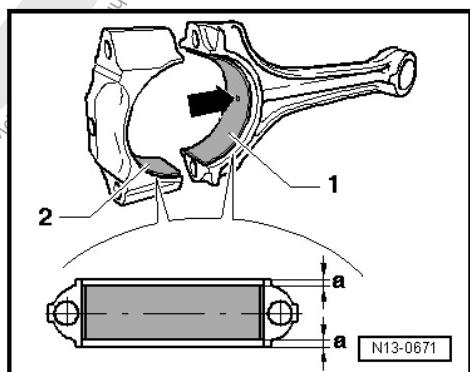
### 3.4 Bearing Shells - Installation Position

Bearing shell -1- with connecting rod oil filler hole -arrow-.

Bearing shell -2- without oil filler hole for connecting rod cover.

- Place the bearing shells centrally into connecting rod and connecting rod bearing cap.

The dimension -a- must be the same at left and right.



### 3.5 Piston and Cylinder Dimensions

Honing dimension	Piston and Cylinder Dimensions	
Dimensions in mm	Piston diameter <sup>1)</sup>	Cylinder bore diameter
Standard dimension	80.960	81.010

1) Take measurement approximately 12 mm from the lower edge of the piston and offset 90° to the piston pin axis.



### 3.6 Piston Projection in Top Dead Center (TDC), Checking

[⇒ "1.4 Cylinder Head Gasket Identification", page 84](#)

Special tools and workshop equipment required

- ◆ Measuring Bar - VW382/7-
- ◆ Measuring Set - Magnetic Plate - 50mm - VW385/17-
- ◆ Dial Gauge - 0-10mm - VAS6079-

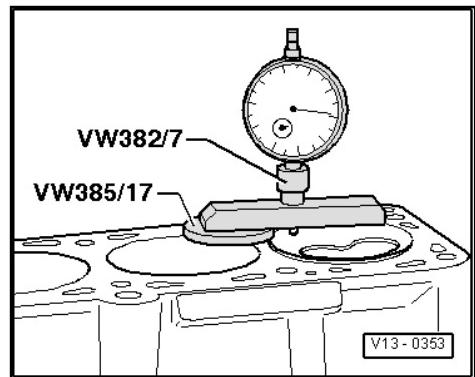
#### Test Sequence

When installing new pistons or working with a partial engine, check the piston projection in TDC on all pistons. Depending on the piston projection, install the corresponding cylinder head gasket according to the following table.



#### Note

- ◆ To measure the piston position at TDC, turn the engine clockwise.
- ◆ If varying values occur when measuring the projection, use the gasket for the largest value.



Piston Projection	Identification Notches/Holes
Dimensions in mm	
0.91 to 1.00	1
1.01 to 1.10	2
1.11 to 1.20	3



## 4 Crankshaft

- ⇒ “4.1 Overview - Crankshaft”, page 72
- ⇒ “4.2 Crankshaft Dimensions”, page 73
- ⇒ “4.3 Needle Bearings, Removing and Installing from Crankshaft”, page 74

### 4.1 Overview - Crankshaft



#### Caution

- ◆ If the crankshaft is removed, a new intermediate sprocket must  
-Item 14- ⇒ [Item 14 \(page 141\)](#) be installed with coating and the hub -Item 11- ⇒ [Item 11 \(page 141\)](#) including the bolt -Item 12- ⇒ [Item 12 \(page 141\)](#) and axial bearing discs -Item 13- ⇒ [Item 13 \(page 141\)](#) must be replaced, or else the backlash will not be correct.
- ◆ Installation procedure. Refer to ⇒ [“2.4.2 New Balance Shaft Assembly, Installing”, page 148](#), New Balance Shaft Assembly, Installing





### 1 - Bearing Shells 1, 2, 4 and 5

- For bearing cap without oil groove
- For cylinder block with oil groove
- Do not interchange used bearing shells (mark them)

### 2 - Bolts

- $65 \text{ Nm} + \frac{1}{4}$  ( $90^\circ$ ) additional turn
- Always replace
- Tighten to  $65 \text{ Nm}$  to measure radial clearance but do not tighten further.

### 3 - Bearing Cap

- Bearing cap 1: belt pulley side
- Bearing cap 3 with openings for thrust washers
- Retaining tabs for cylinder block/bearing cap bearing shells must lie above one another

### 4 - Bearing Shell 3

- For bearing cap without oil groove
- For cylinder block with oil groove

### 5 - Thrust Washer

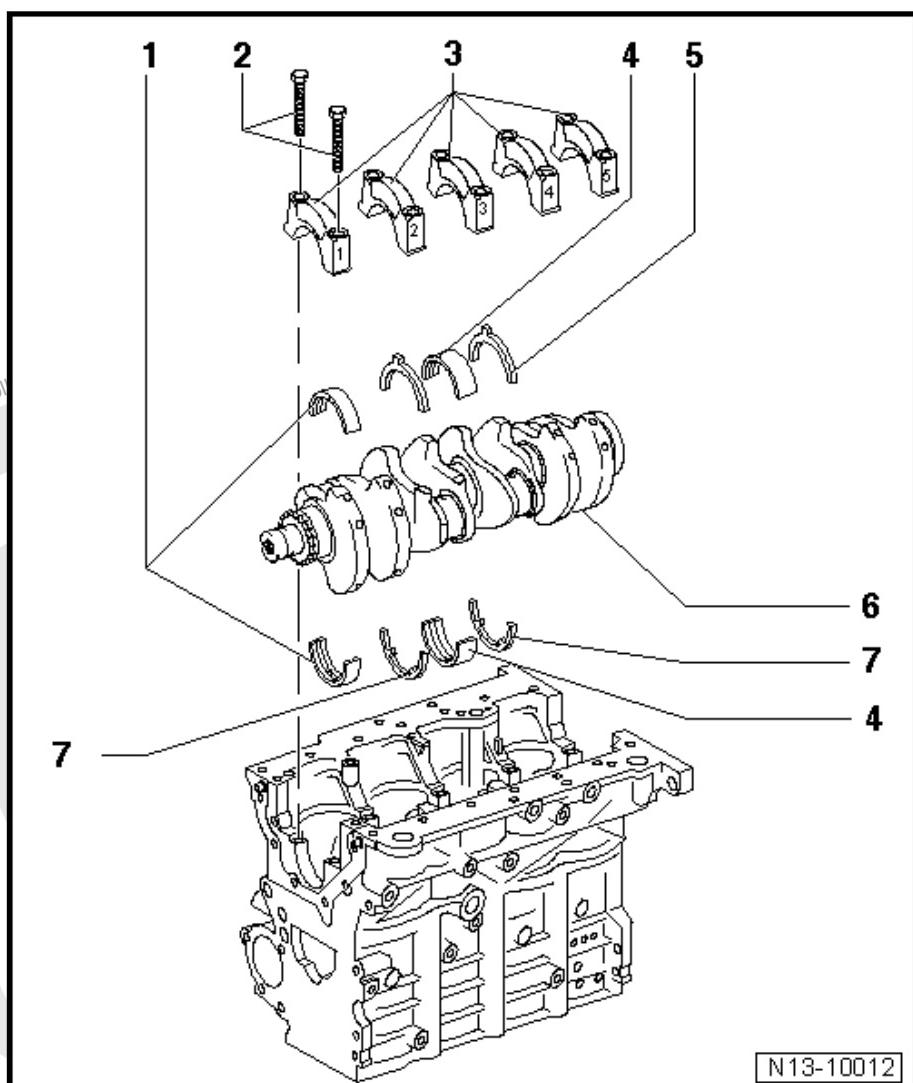
- For the bearing cap 3
- Pay attention to the installation position

### 6 - Crankshaft

- "Pay attention to the warnings". Refer to [page 72](#).
- New axial play: 0.07 to 0.17; wear limit: 0.37 mm
- Measure the radial clearance with Plastigage®. New: 0.03 to 0.08 mm, wear limit: 0.17 mm
- Do not turn the crankshaft when measuring radial clearance
- Crankshaft dimensions. Refer to ["4.2 Crankshaft Dimensions", page 73](#).

### 7 - Thrust Washer

- For cylinder block, bearing 3



## 4.2 Crankshaft Dimensions

Dimension	Crankshaft Bearing Pin Diameter	Connecting Rod Bearing Pin Diameter
Dimensions in mm		
Standard dimension	54.000 -0.022 -0.042	50.90 -0.022 -0.042



## 4.3 Needle Bearings, Removing and Installing from Crankshaft

Only Vehicles with a DSG® Transmission

Special tools and workshop equipment required

- ◆ Puller - Kukko Internal - 14-19mm - 21/2-
- ◆ Puller - Kukko Counterstay - 22/1-
- ◆ Alignment Tool - Clutch Plate - 3176-
- ◆ Bearing Installer - Bearing Press Piece - VW207C-

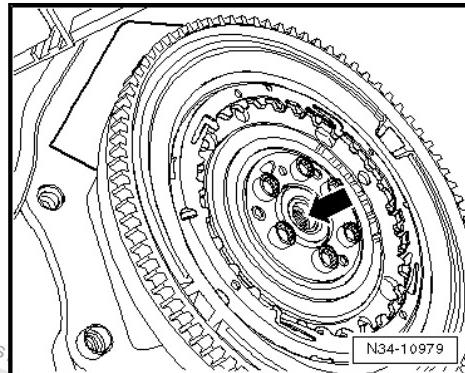


*Always replace the needle bearing -arrow- if the engine or the transmission is being removed.*

### Procedure

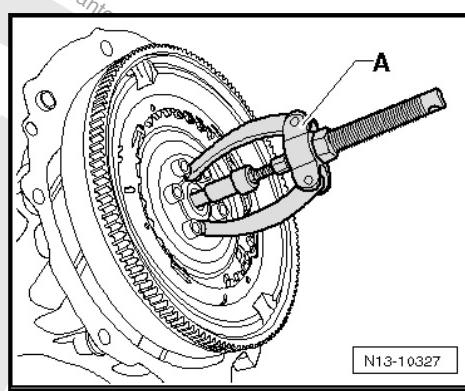
- The transmission is unflanged from the engine

Remove the needle bearing:



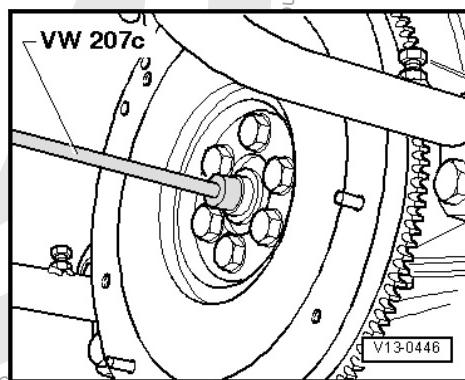
- Remove with a commercially available puller -A-, for example -21/2- and Puller - Kukko Counterstay - 22/1- .

### Installing



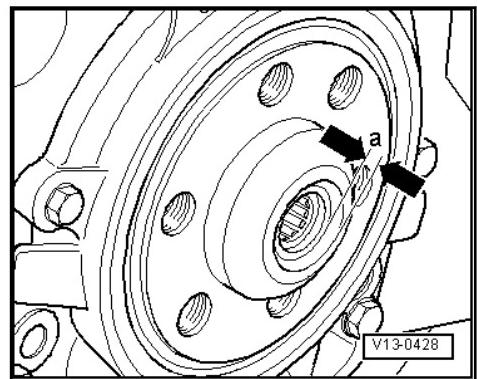
- Needle bearing with -VW207C- or with -3176- .
- Carefully install the needle bearing.
- Measure the installation depth constantly while installing.

Replace Bearings That Have Been Installed Too Deep.





- Installation depth: dimension -a- = 1.5 to 1.8 mm.





## 15 – Cylinder Head, Valvetrain

### 1 Cylinder Head

- ⇒ “1.1 Overview - Cylinder Head Cover”, page 76
- ⇒ “1.2 Overview - Cylinder Head”, page 78
- ⇒ “1.3 Overview - Toothed Belt Drive”, page 81
- ⇒ “1.4 Cylinder Head Gasket Identification”, page 84
- ⇒ “1.5 Camshaft Position Sensor G40 , Removing and Installing”, page 84
- ⇒ “1.6 Engine Cover, Removing and Installing”, page 87
- ⇒ “1.7 Cylinder Head Cover, Removing and Installing”, page 87
- ⇒ “1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92
- ⇒ “1.9 Cylinder Head, Removing and Installing”, page 99
- ⇒ “1.10 Vacuum Pump, Removing and Installing”, page 122
- ⇒ “1.11 Compression, Checking”, page 123

#### 1.1 Overview - Cylinder Head Cover





**1 - Bolt**

- 5 Nm

**2 - Bolt**

- 22 Nm

**3 - Protective Strip**

- For the rail element (high pressure reservoir) and high pressure lines

**4 - Rail Element (High Pressure Reservoir)**

- With high pressure lines
- Do not change the angles of the high pressure lines
- Refer to [“3.3 Overview - Fuel System”, page 285](#). Overview - Fuel System

**5 - Bolt**

- 5 Nm

**6 - Fuel Injector Cover**

**7 - Nut**

- 10 Nm

**8 - Tensioning Claw**

- Always replace
- Note the installation position Refer to [“Tensioning Bracket Installation Position”, page 288](#).

**9 - Fuel Injector (Piezo Injector)**

Overview - Fuel System. Refer to [“3.3 Overview - Fuel System”, page 285](#).

**10 - Bracket**

- For wiring harness

**11 - Vacuum Hose**

- Check for secure fit and kink free routing
- To the Wastegate Bypass Regulator Valve - N75-

**12 - Cylinder Head Cover**

- Removing and installing. Refer to [“1.7 Cylinder Head Cover, Removing and Installing”, page 87](#).

**13 - Seal**

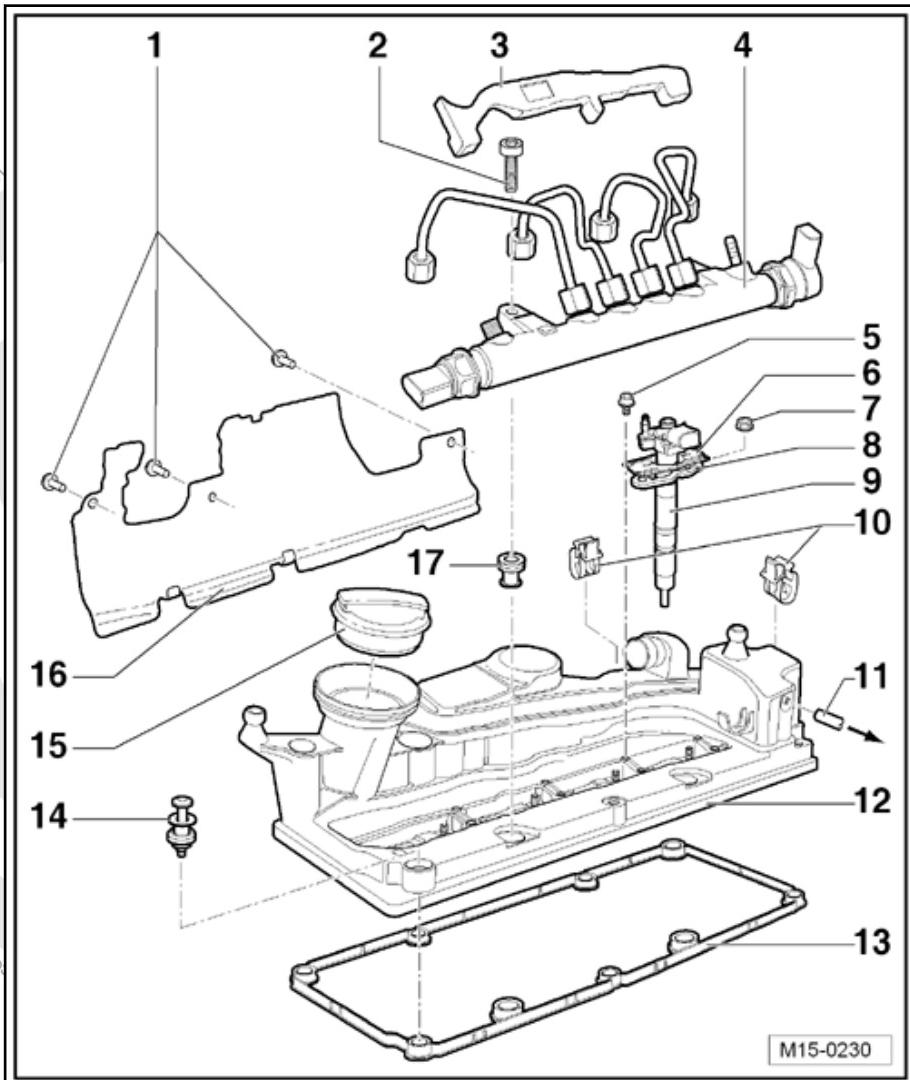
- Replace if damaged or leaking

**14 - Bolts**

- 10 Nm
- Observe the sequence for loosening and tightening . Refer to [“1.7 Cylinder Head Cover, Removing and Installing”, page 87](#), Cylinder Head Cover, Removing and Installing

**15 - Cap**

- Replace the seal if damaged.



M15-0230



## 16 - Heat Shield

## 17 - Bushing

- Replace if damaged
- For the rail element (high pressure reservoir) - mounting

## 1.2 Overview - Cylinder Head





## 1 - Cylinder Head

- Observe the notes. Refer to [page 91](#).
- Checking for distortion. Refer to [Fig. "Cylinder Head, Checking for Distortion"](#), page 80.
- Removing and installing. Refer to ["1.9 Cylinder Head, Removing and Installing"](#), page 99.
- All of the coolant must be replaced after installing.
- Compression Pressure, Checking. Refer to ["1.11 Compression, Checking"](#), page 123.

## 2 - Washer

- For the cylinder head bolt

## 3 - Cylinder Head Bolt

- Observe the sequence for loosening and tightening . Refer to ["1.9 Cylinder Head, Removing and Installing"](#), page 99 , Cylinder Head, Removing and Installing
- Before installing, insert washers -Item 2- [Item 2 \(page 79\)](#) into cylinder head

## 4 - Bolt

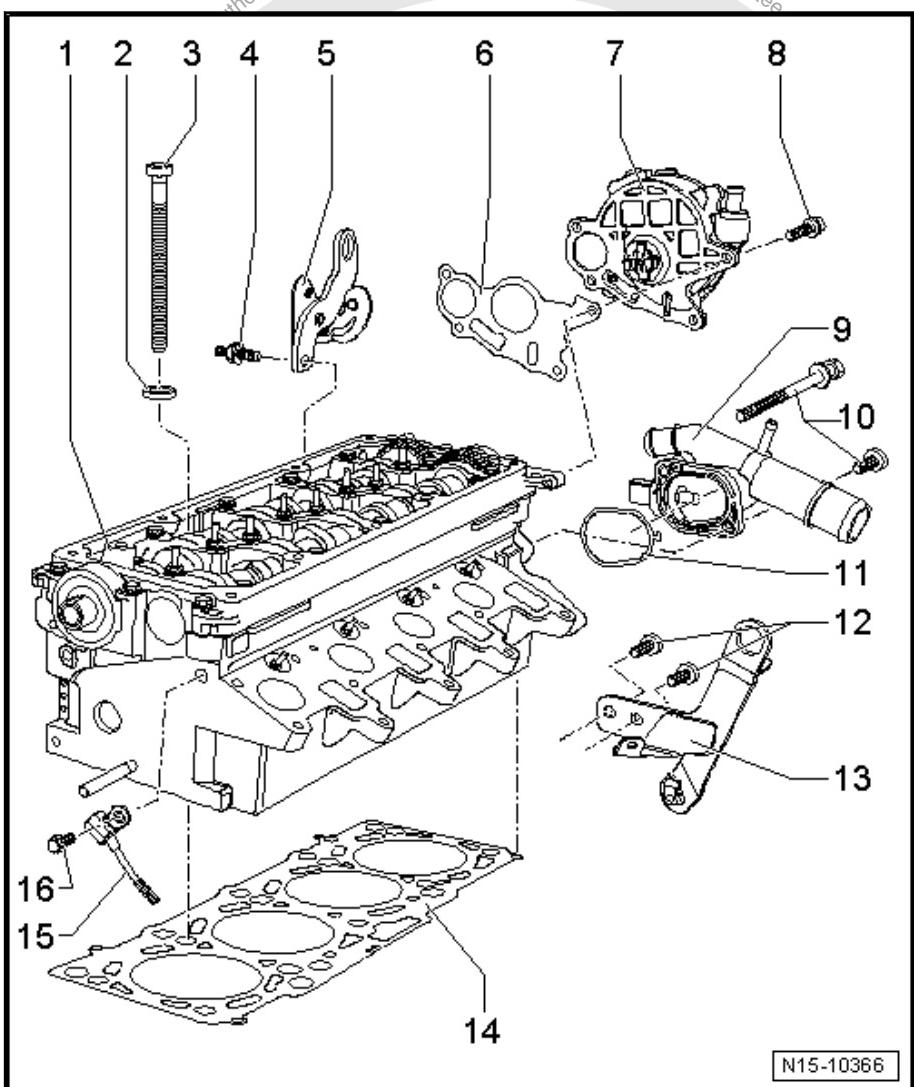
- 25 Nm

## 5 - Lifting Eye

## 6 - Seal

- Always replace

## 7 - Vacuum Pump



N15-10366



- Removing and installing. Refer to ["1.10 Vacuum Pump, Removing and Installing"](#), page 122 .

## 8 - Bolt

- 10 Nm

## 9 - Coolant Connection



- Coolant Hose Connection Diagram. Refer to [“1.4 Coolant Hose Connection Diagram”, page 183](#).

#### 10 - Bolt

- 10 Nm

#### 11 - Seal

- Always replace

#### 12 - Bolt

- 25 Nm

#### 13 - Lifting Eye

#### 14 - Cylinder Head Gasket

- Always replace
- Observe the identification. Refer to [Fig. “Cylinder Head Gasket Identification” , page 81](#).
- All of the coolant must be replaced after replacing

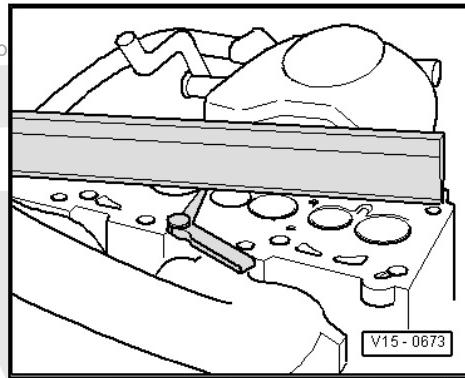
#### 15 - Camshaft Position Sensor - G40-

- For camshaft position

#### 16 - Bolt

- 10 Nm

### Cylinder Head, Checking for Distortion



#### Special tools and workshop equipment required

- ◆ Straight Edge - 500mm - VAS6075-
- ◆ Feeler Gauge

#### Procedure

- Check the cylinder head in several places for distortion using a -VAS6075- and a feeler gauge.
- Maximum permitted distortion: 0.10 mm.



**Note**

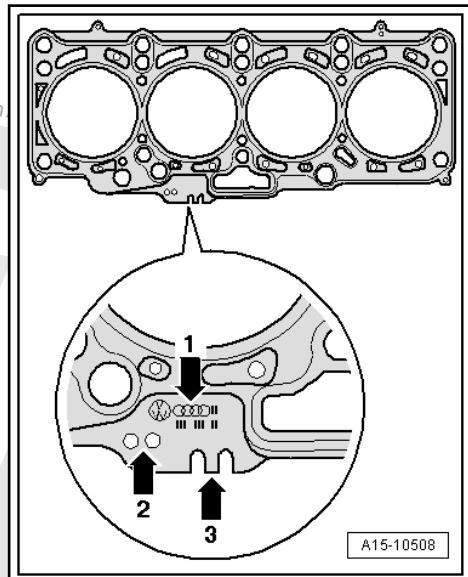
*Remanufacturing diesel cylinder heads is not permitted.*

**Cylinder Head Gasket Identification**

- ◆ Part number = -arrow 1-
- ◆ Holes = -arrow 2-
- ◆ Ignore = -arrow 3-
- ◆ Installed position: the identification mark faces up.

**Note**

- ◆ Depending on piston projection, varying cylinder head gasket thicknesses can be installed. When replacing a gasket, install a gasket with the same identification -arrow 3-.
- ◆ Determine the piston position at TDC when installing new pistons or a partial engine. Refer to ["3.6 Piston Projection in Top Dead Center \(TDC\), Checking"](#), page 71 .



## 1.3 Overview - Toothed Belt Drive



### 1 - Toothed Belt

- Mark the running direction before removing
- Check for wear
- Do not kink
- Removing and installing, tensioning. Refer to ["1.8 Toothed Belt, Removing, Installing and Tensioning", page 92](#).

### 2 - Bolt

- 120 Nm +  $\frac{1}{4}$  (90 °) additional turn
- Always replace
- Use Counterhold - Crankshaft Sprocket - 3415- when loosening or tightening
- Do not lubricate or grease the threads and collar
- Additional rotation can occur in several stages

### 3 - Crankshaft Toothed Belt Sprocket

### 4 - Nut

- 20 Nm

### 5 - Idler Roller

### 6 - Nut

- 20 Nm +  $\frac{1}{8}$  (45 °) additional turn
- Always replace

### 7 - Tensioning Roller

- Remove the engine bracket to remove and install. Refer to ["1.6 Engine Bracket, Removing and Installing", page 46](#).

### 8 - 20 Nm + $\frac{1}{8}$ (45 °) additional turn

- Always replace

### 9 - Camshaft Sprocket

### 10 - Bolt

- 25 Nm

### 11 - Bolt

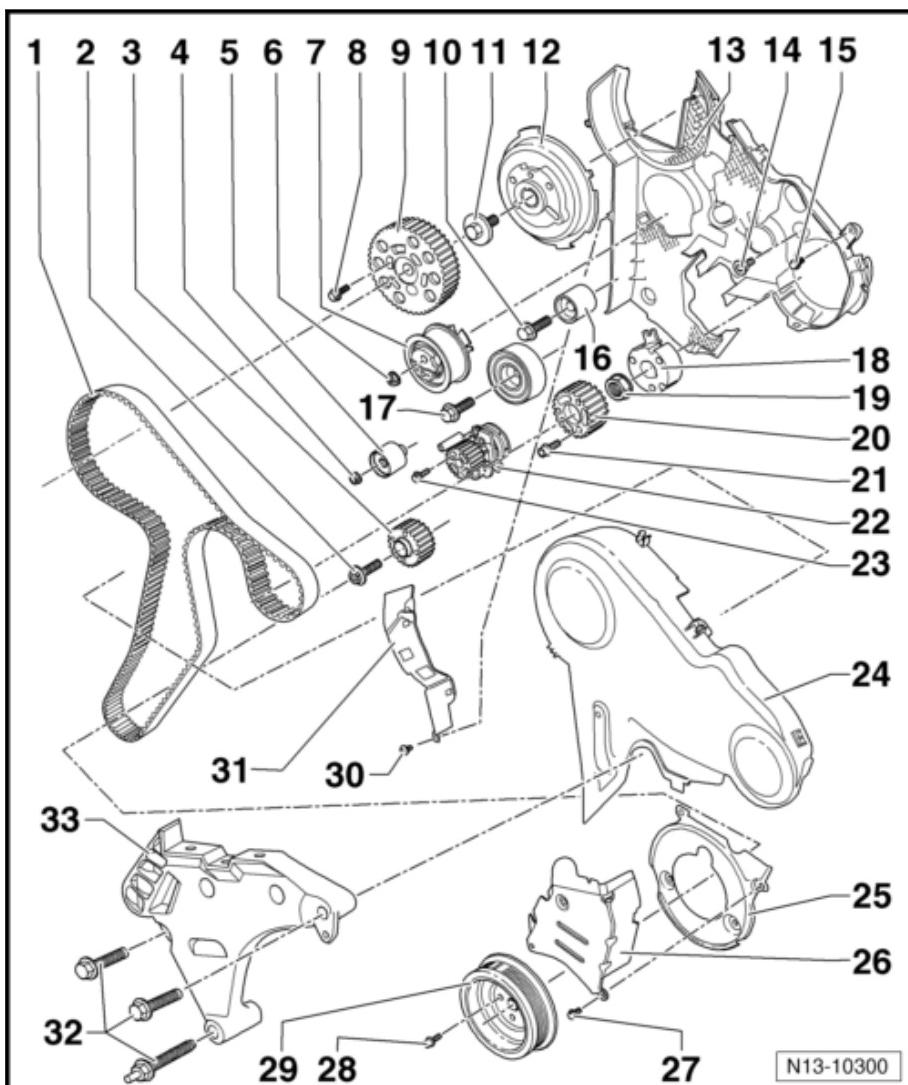
- 100 Nm

### 12 - Hub

- Use the Counterhold - Camshaft Gear - T10051- to loosen and tighten
- To remove, use Puller - Camshaft Sprocket - T10052- .
- Removing and installing. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#), Camshaft, Removing and Installing

### 13 - Rear Toothed Belt Guard

### 14 - Bolt





- 20 Nm

**15 - Bolt**

- 10 Nm
- Always replace

**16 - Idler Roller**

**17 - Bolt**

- 50 Nm + 1/4 (90°) additional turn
- Always replace

**18 - Hub**

- Use the Counterhold - Camshaft Gear - T10051- to loosen and tighten
- Use Puller - Pulley - T40039- to remove.
- Removing and installing. Refer to ["3.9 High Pressure Fuel Pump, Removing and Installing", page 301](#).

**19 - Nut**

- 95 Nm

**20 - High Pressure Fuel Pump Toothed Belt Sprocket**

**21 - Bolt**

- 20 Nm
- Always replace

**22 - Coolant Pump**

- Removing and installing. Refer to ["1.7 Coolant Pump, Removing and Installing", page 189](#).

**23 - Bolt**

- 15 Nm

**24 - Toothed Belt Guard Upper Section**

- Installing. Refer to [Fig. "Toothed Belt Guard Upper Section, Installing"](#), page 84.

**25 - Toothed Belt Guard Lower Section**

**26 - Toothed Belt Guard Center Section**

**27 - Bolt**

- 10 Nm
- Always replace

**28 - Bolt**

- 10 Nm + 1/4 (90 °) additional turn
- Always replace

**29 - Belt Pulley/Vibration Damper**

- Only possible to install in one position - hole are offset

**30 - Bolt**

- 5 Nm

**31 - Protective Plate**

**32 - Bolt**

- 40 Nm + 1/2 (180 °) additional turn
- Always replace
- Note the tightening sequence. Refer to [Fig. "Engine Bracket to Cylinder Block Tightening Sequence"](#), page 20.

**33 - Engine Bracket**

- Removing and installing. Refer to ["1.6 Engine Bracket, Removing and Installing", page 46](#).



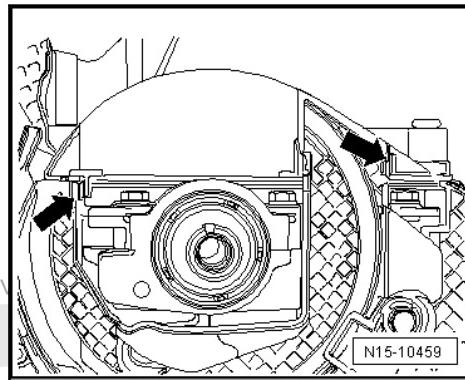
### Toothed Belt Guard Upper Section, Installing

- Make sure the toothed belt guard upper section is clipped into the cylinder head cover correctly.



The camshaft is removed here for clarity.

- Press the toothed belt guard upper section near the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.
- Check the clearance between the hub and the toothed belt guard upper section.

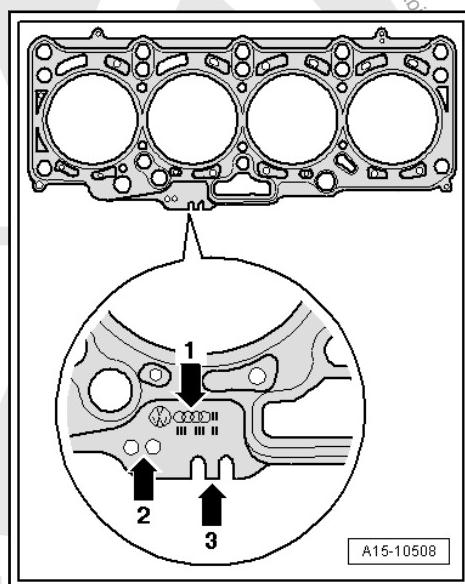


### 1.4 Cylinder Head Gasket Identification

- Part number = -arrow 1-
- Holes = -arrow 2-
- Control code = -arrow 3- (ignore this!)

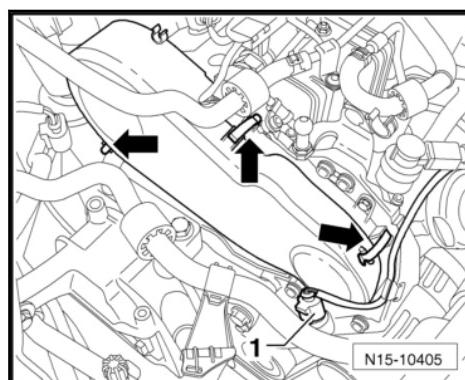


- Depending on piston projection, varying cylinder head gasket thicknesses can be installed. Be sure to use a gasket having the identical identification when replacing.
- Determine the piston position in TDC when installing new pistons or partial engines. Refer to ["3.6 Piston Projection in Top Dead Center \(TDC\), Checking"](#), page 71.



### 1.5 Camshaft Position Sensor - G40-, Removing and Installing

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing"](#), page 87.
- Remove the fuel filter and the Auxiliary Fuel Pump - V393-. Refer to ["6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing"](#), page 236.
- Disconnect the connector from the Engine Coolant Temperature Sensor on Radiator Outlet - G83- .
- Open the clamps -arrows- and remove the toothed belt guard.
- Remove the right front wheel housing liner.
- Remove the ribbed belt. Refer to ["1.3 Ribbed Belt, Removing and Installing"](#), page 42.
- Remove the vibration damper -Item 29- [Item 29 \(page 83\)](#).



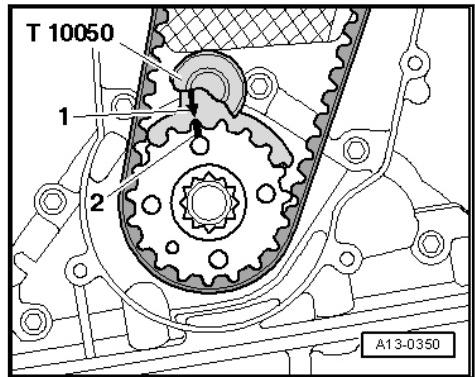


- Rotate the engine to TDC and secure the crankshaft toothed belt sprocket with the -T10050-. Push the crankshaft stop from the front side of the toothed belt sprocket into the splines. The camshaft toothed segment must be in the »12 o'clock« position.

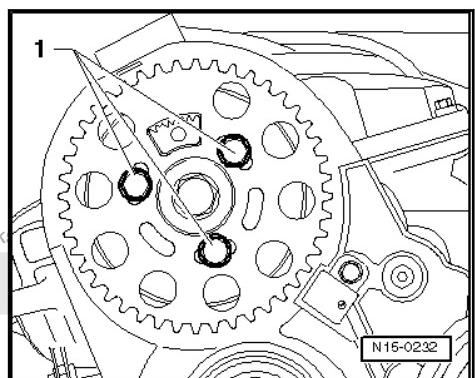


### Note

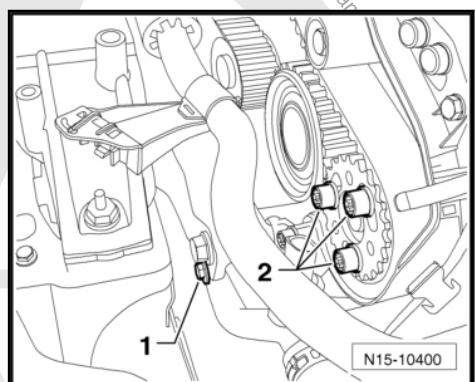
*The markings on the crankshaft toothed belt sprocket -2- and the -T10050- -1- must align. The pin on the -T10050- must engage in the hole on the sealing flange.*



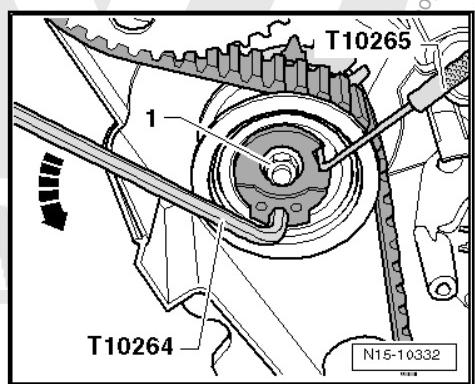
- Loosen the camshaft sprocket bolts -1-.



- Loosen the coolant pipe bolt -1- and then the bolts for the high pressure pump toothed belt sprocket -2-.

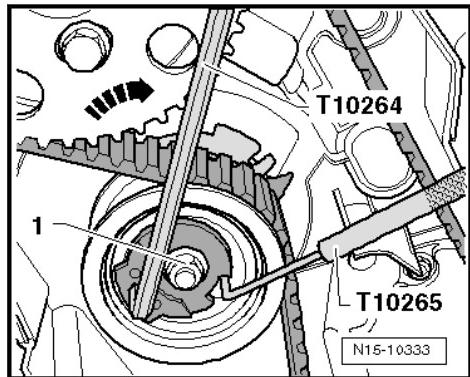


- Loosen the tensioning roller nut -1- and turn the tensioning roller eccentric pulley with the -T10264- counter-clockwise in direction of -arrow-, until the tensioning roller can be locked with the -T10265- .

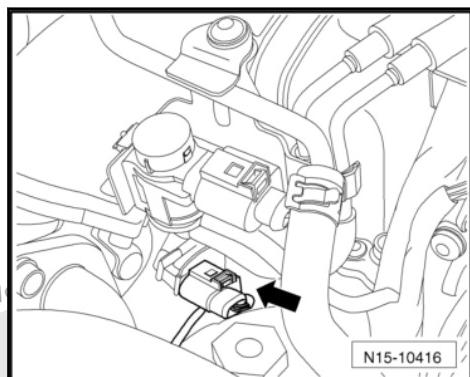




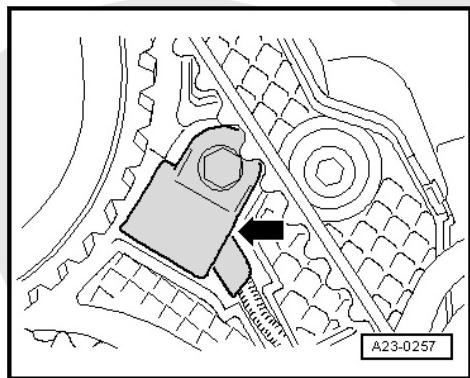
- Now turn the tensioning roller eccentric pulley clockwise in direction of -arrow- all the way and tighten the nut -1- by hand.
- Remove the toothed belt from the idler roller and the high pressure pump.



- Disconnect the connector for the Camshaft Position Sensor - G40- -arrow-.
- Disconnect from the retainer.



- Remove the Camshaft Position Sensor - G40- -arrow-.
- Remove the ribs with a screwdriver and remove the cover for the opening -arrows-.

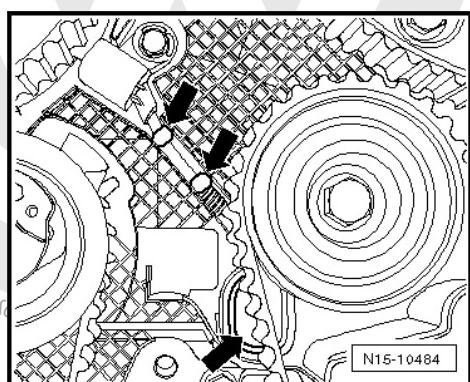


- Remove the Camshaft Position Sensor - G40- from the cylinder head and guide its connector through the opening in the toothed belt guard.

#### Installing

Install in reverse order of removal. Note the following:

- ♦ Seal the opening in the toothed belt guard with a rubber plug. Refer to the Parts Catalog.
- Mount the toothed belt and adjust the valve timing. Refer to [⇒, page 95](#).





## 1.6 Engine Cover, Removing and Installing

### Removal

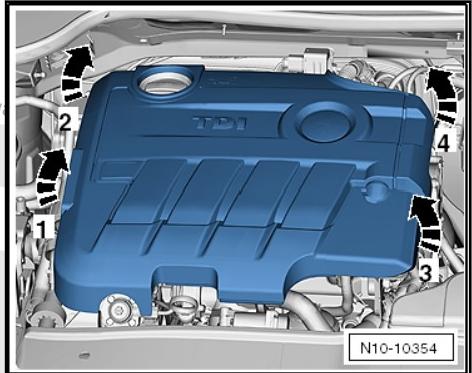
- Pull the engine cover at the corners in direction of -arrows-upward out of the mounting points with a jerking motion.

### Installing



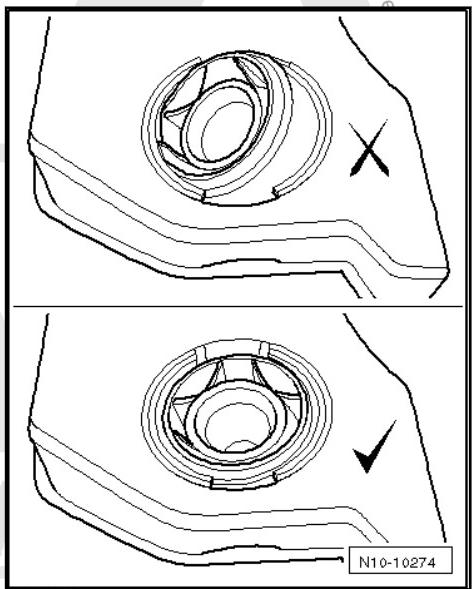
#### Caution

*Make sure the four fasteners (ball sockets) are positioned correctly before installing the engine cover. Move them back into their position, if necessary. Otherwise the engine cover could be damaged.*



N10-10354

- Press the engine cover ball sockets into the correct installation position if necessary.
- Position the engine cover on the mounting points and press the corners into the retainers.



N10-10274

## 1.7 Cylinder Head Cover, Removing and Installing



### Note

- When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.
- Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.
- After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.
- Always replace the self-locking nuts, seals, gaskets and clamps.
- Overview - Cylinder Head Cover. Refer to ["1.1 Overview - Cylinder Head Cover", page 76](#).

### Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-



- ◆ Hose Clip Pliers - VAS6362-
- ◆ Union Nut Socket - T40055-
- ◆ Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-
- ◆ Engine Bung Set - VAS6122-



### DANGER!

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).*

*Always pay attention to these instructions before and during work.*



### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations.*
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*

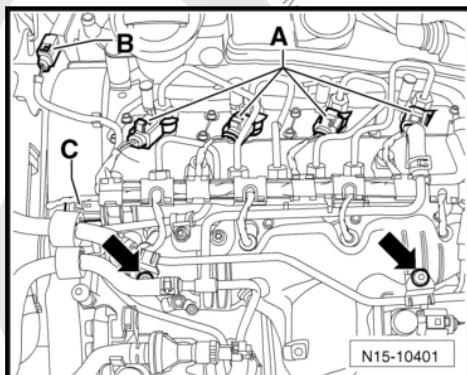
## Removing

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Remove the protective strip -Item 3- [⇒ Item 3 \(page 77\)](#).
- Disconnect from the fuel injectors -A-, the Exhaust Pressure Sensor 2 - G451- -B- and the Fuel Pressure Sensor - G247- -C-.
- Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.
- Unclip the wiring harness from the wiring guide for the glow plugs.



### Caution

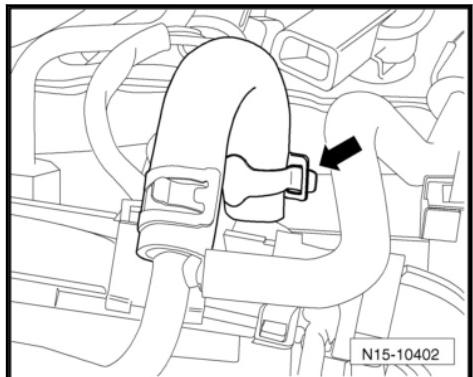
*Always follow the procedure »Glow Plug Connectors, Removing and Installing«.*



- Remove the glow plug connectors. Refer to ["1.3 Glow Plug Connectors, Removing and Installing", page 402](#).
- Remove the fuel return line bolt -Item 3- [⇒ Item 3 \(page 286\)](#) on the intake manifold.



- Loosen the hose clip -arrow- with the -VAS6362- and remove the line on the rail element (high pressure reservoir).
- Before removing, clean the return line connection on the fuel injectors (for example using a commercially available detergent).
- Cover the return line connections with a cleaning cloth.

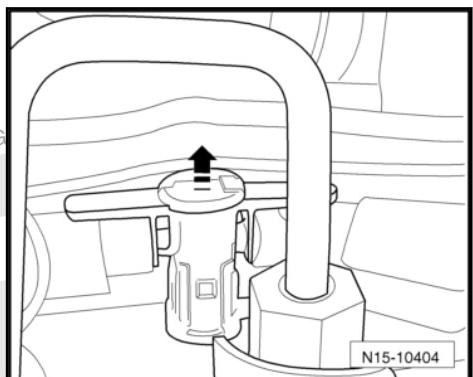


- Remove the fuel return line connections on the fuel injectors. Pull them upward to release them in direction of -arrow-.

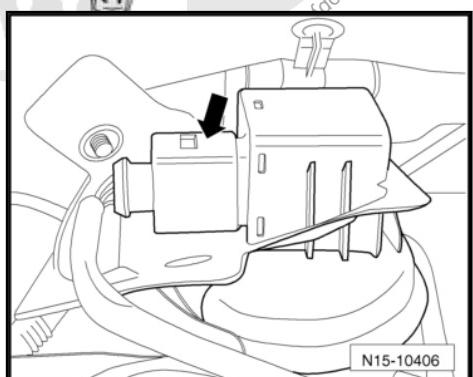
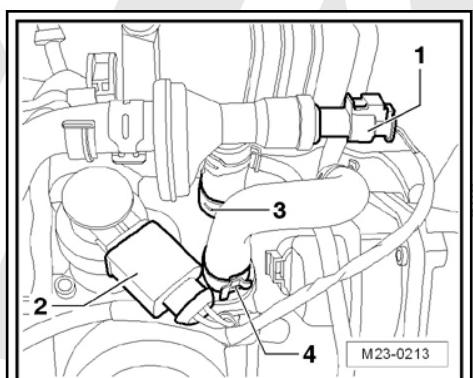


#### Note

- ◆ *Follow the rules of cleanliness.*
- ◆ *Do not let any dirt to get into the disconnected return lines or into the connections for the fuel injectors.*
- Loosen the spring clamp with the -VAS6362- and remove the fuel return line -Item 4- [⇒ Item 4 \(page 286\)](#) .
- Loosen the spring clamp -4- with the -VAS6362- and disconnect the fuel return line at the high-pressure fuel pump.
- Seal the lines so that no dirt can enter the fuel system.
- Remove the fuel return line -Item 2- [⇒ Item 2 \(page 286\)](#) and lay them in front of the intake manifold.

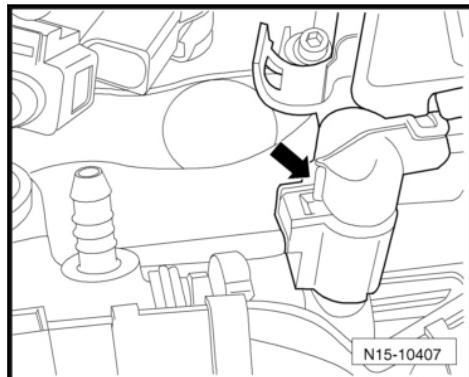


- Disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -arrow- at the turbocharger vacuum diaphragm and guide the line out of the holders.





- Disconnect the connector from the Fuel Pressure Regulator Valve - N276- -arrow-.
- Remove the wiring guide on the rail elements (high pressure reservoir) and move to the side.
- Remove the vacuum hose -Item 11- [⇒ Item 11 \(page 77\)](#) from the cylinder head cover.
- Remove the remaining vacuum hoses from the bracket on the cylinder head cover.

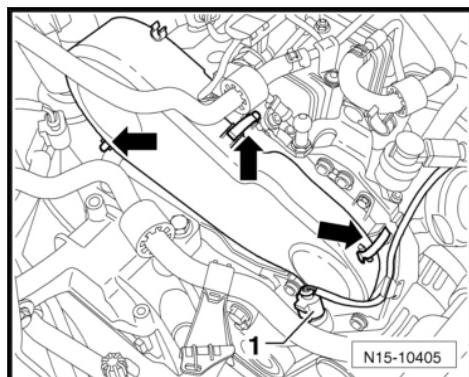


- Disconnect the connector -1- from the Engine Coolant Temperature Sensor on Radiator Outlet - G83- , open the clamps -arrows- and remove the toothed belt guard upper section.
- Remove the crankcase ventilation hose between the intake scoop and the cylinder head cover.

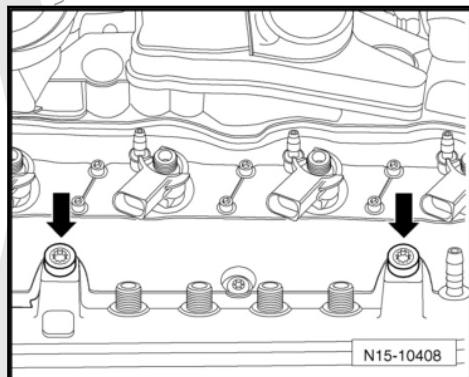
**Note**

*The crankcase ventilation hose is destroyed when it is removed.*

- Remove the high pressure line -Item 21- [⇒ Item 21 \(page 288\)](#) between the high pressure fuel pump and rail element (high pressure reservoir).
- Remove the high pressure lines -Item 5- [⇒ Item 5 \(page 286\)](#) between the rail element (high pressure reservoir) and the fuel injectors.
- Remove the bolts -arrows- and remove the rail element (high pressure reservoir).



Remove the fuel injectors. Refer to [⇒ “3.5 Fuel Injector \(Piezo Injector\), Removing and Installing and High Pressure Lines, Installing”, page 292 .](#)





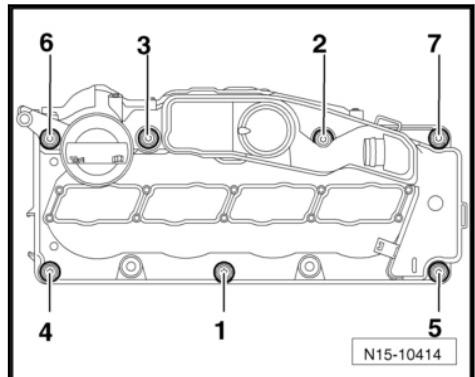
- Remove the cylinder head cover bolts in the sequence -7 to 1-.
- Remove the cylinder head cover.

**Installing:**



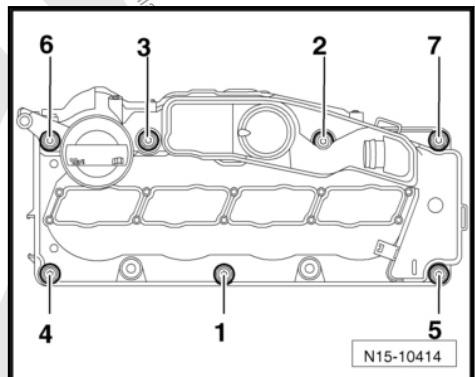
**Note**

- ◆ *The plastic protectors installed to protect the open valves must only be removed just before mounting the cylinder head.*
- ◆ *When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.*
- ◆ *Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.*
- ◆ *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- ◆ *Always replace the self-locking nuts, seals, gaskets and clamps.*



Install in reverse order of removal. Note the following:

- Replace the cylinder head cover gasket if damaged or leaking. Refer to Parts Catalog.
- When installing the high pressure line or fuel lines, make sure no dirt enters the fuel system.
- Only remove the plugs right before installing the fuel lines.
- Do not change the angles of the high pressure lines
- Make sure the line connections are secure.
- Do not interchange the supply line and the return line.
- First hand-tighten the cylinder head cover bolts in the sequence -1 to 7-.
- Then tighten the cylinder head cover bolts in the sequence -1 to 7-.
- Tightening specification -Item 14- [⇒ Item 14 \(page 77\)](#) .
- Install the toothed belt guard upper section.



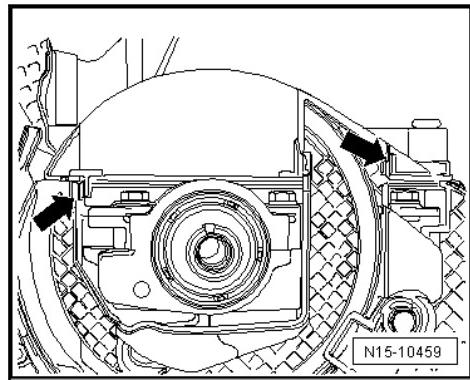


- Make sure the toothed belt guard upper section is clipped into the cylinder head cover correctly.



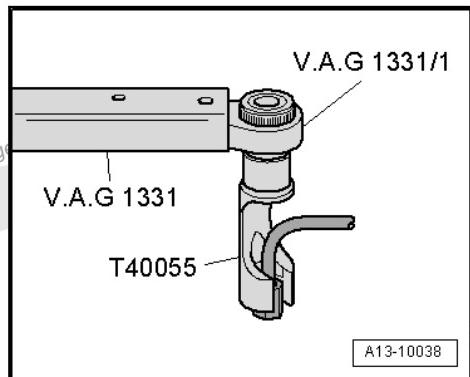
*The camshaft is removed here for clarity.*

- Press the toothed belt guard upper section near the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.
- Check the clearance between the hub and the toothed belt guard upper section.
- Tighten the high pressure line union nuts hand-tight.
- Make sure the high pressure line is without tension.
- Tighten the high pressure line using the -VAG1331- with -VAG1331/1- and -T40055- .



#### Tightening Specifications:

- Refer to [“1.7 Cylinder Head Cover, Removing and Installing”, page 87](#), Cylinder Head Cover, Removing and Installing
- Overview - Fuel System. Refer to [“3.3 Overview, Fuel System”, page 285](#).
- Fill the fuel system. Refer to [“3.10 Fuel System, Filling/Bleeding”, page 304](#).



## 1.8 Toothed Belt, Removing, Installing and Tensioning

#### Special tools and workshop equipment required

- ◆ Diesel Injection Pump Locking Pin - 3359-
- ◆ Crankshaft Stop - T10100- or Crankshaft Stop - T10050-
- ◆ Counterhold - Kit - Multiple Use - T10172-
- ◆ Wrench - Tensioning Roller - T10264-
- ◆ Tensioning Roller Locking Tool - T10265-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-



*Overview - Toothed Belt Drive. Refer to [“1.3 Overview - Toothed Belt Drive”, page 81](#).*

#### Removing

#### Requirements

- Ignition switched off.
- Engine must be cold.

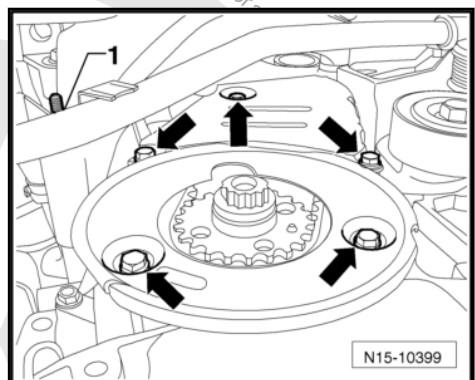
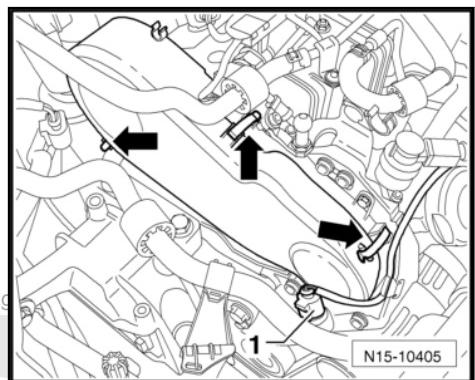


## Note

- ◆ *Adjustments to toothed belt may generally only be performed when the engine is cold, because the indicator position of the tensioning element changes depending on engine temperature.*
- ◆ *The engine bracket must be removed in order to replace the tensioning roller. Refer to ["1.6 Engine Bracket, Removing and Installing", page 46](#).*

## Procedure

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Remove the fuel filter. Refer to ["6.3 Fuel Filter, Removing and Installing", page 229](#).
- Remove the Auxiliary Fuel Pump - V393-. Refer to ["6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing", page 236](#).
- Disconnect the connector -1- from the Engine Coolant Temperature Sensor on Radiator Outlet - G83-, open the clamps -arrows- and remove the toothed belt guard upper section.
- Remove the right front wheel housing liner. Refer to [Body Exterior; Rep. Gr. 66 ; Wheel Housing Liner](#).
- Remove the ribbed belt. Refer to ["1.3 Ribbed Belt, Removing and Installing", page 42](#).
- Remove the belt pulley/vibration damper -Item 29- [\(page 83\)](#).



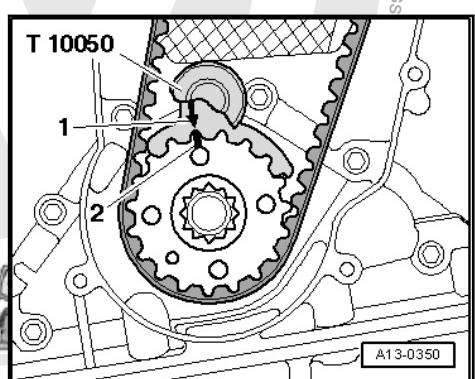
- Remove the toothed belt guard lower section and center section -arrows-.
- Remove the nut from the coolant pipe -1-.

- Rotate the engine to Top Dead Center (TDC) and secure the crankshaft toothed belt gear using the -T10100- or the -T10050-. Push the crankshaft stop from the front side of the toothed belt gear into the teeth. The toothed gear must be in the "12 o'clock" position.

## Note

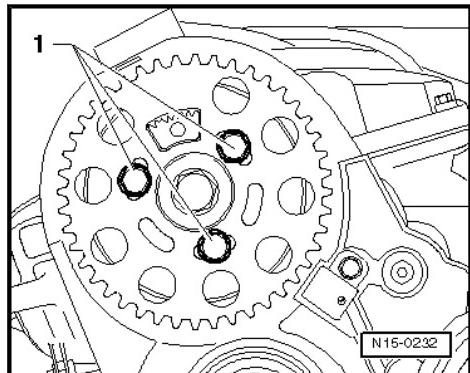
*The markings on the crankshaft toothed belt sprocket -2- and the -T10050- -1- must align. The pin on the T10050- must engage in the hole on the sealing flange.*

- Mark the toothed belt running direction.

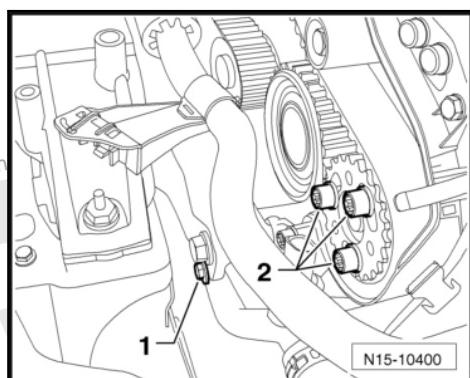




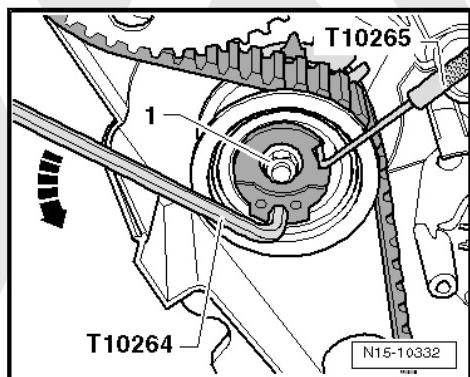
- Loosen the camshaft sprocket bolts -1-.



- Loosen the coolant pipe bolt -1- and then the bolts for the fuel high pressure pump toothed belt sprocket -2-.



- Loosen the tensioning roller nut -1- and turn the tensioning roller eccentric pulley with the -T10264- counter-clockwise in direction of -arrow-, until the tensioning roller can be locked with the -T10265- .



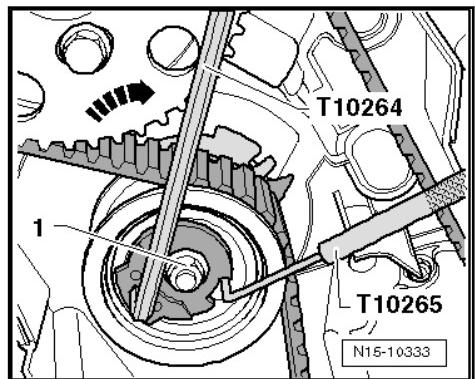


- Now turn the tensioning roller eccentric pulley clockwise in direction of -arrow- all the way and tighten the nut -1- by hand.
- First remove the toothed belt from the idler roller and then from the remaining sprockets.

## Installing

### Conditions

- Ignition switched off.
- Engine must be cold.
- The tensioning roller must be installed with the -T10265- and the roller must be secured on the right stop.
- Secure the crankshaft with the -T10050- .

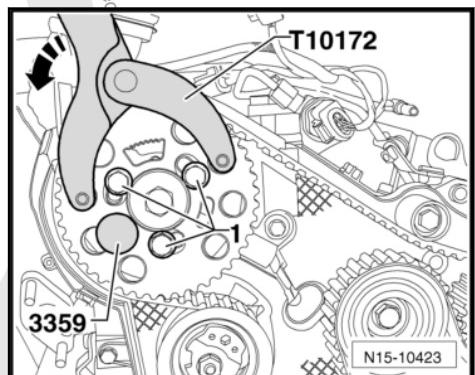


### Note

- Adjustments to toothed belt may generally only be performed when the engine is cold, because the indicator position of the tensioning element changes depending on engine temperature.*
- The engine bracket must be removed in order to replace the tensioning roller. Refer to ["1.6 Engine Bracket, Removing and Installing", page 46](#).*

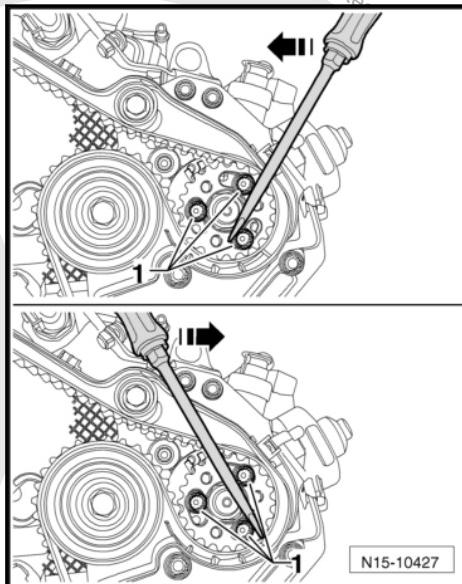
## Procedure

- Turn the camshaft hub with the -T10172- and the -T10172/4- until they can be secured in place. To do so use at least one bolt -1- tightened by hand.
- Lock the camshaft hub with the - 3359- . To do this, push the pin through the empty outer oblong hole and into the cylinder head hole.
- Loosen the bolts -1-, which were hand-tightened.

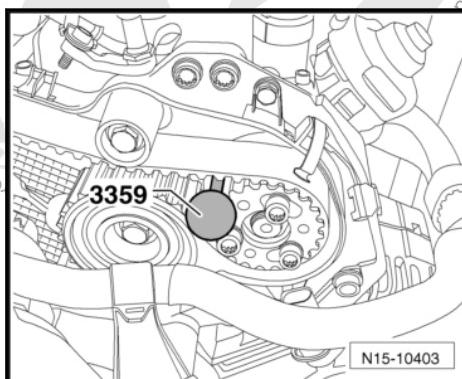




- If necessary, rotate the high pressure fuel pump hub with a screwdriver at the bolt heads -1- until it can be secured.

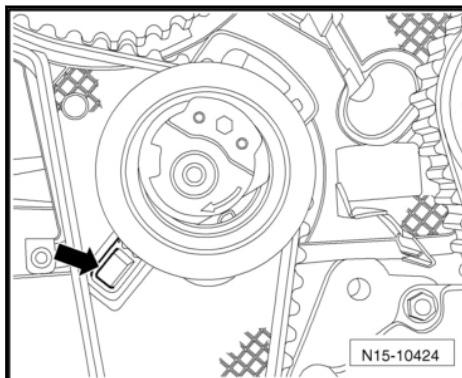


- Lock the high pressure fuel pump hub with the -3359-. To do this, slide the pin into the opening outside the toothed belt sprocket.
- Rotate the camshaft sprocket and fuel high pressure pump toothed belt sprocket clockwise in their oblong holes as far as the stop.
- Install the toothed belt on the crankshaft toothed belt sprocket, the tensioning roller, the camshaft sprocket, coolant pump toothed belt sprocket and the fuel high pressure pump toothed belt sprocket.
- Lay the toothed belt on the idler roller last.
- Loosen the tensioning roller nut and remove the - T10265- .

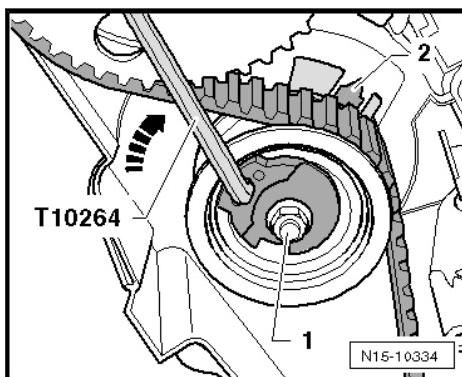


**Note**

*Make sure the tensioning roller is properly positioned in the rear toothed belt guard -arrow-.*

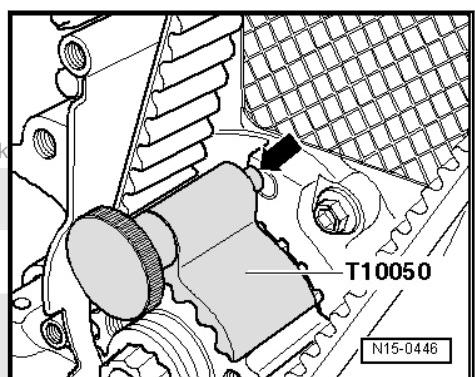
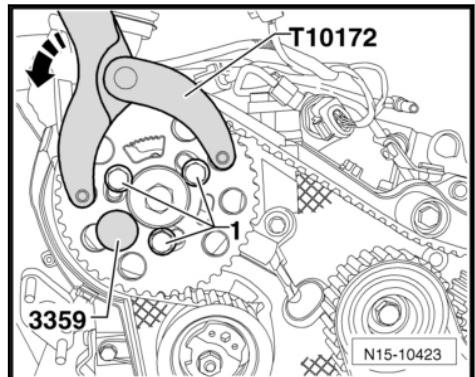


- Carefully turn the tensioning roller eccentric pulley clockwise with the -T10264- until the indicator is located centrally in the base plate gap -2-.
- Make sure the nut -1- does not rotate with it.
- Hold the tensioning roller in this position and tighten the tensioning roller nut.
- Tightening specification. Refer to -Item 6- [Item 6 \(page 82\)](#) .





- Position the - T10172A- as shown. Push the -T10172A- in the direction of the arrow and hold the camshaft sprocket pretensioned.
- Tighten the bolts -1- for the camshaft sprocket and the fuel high pressure pump toothed belt sprocket in this position.
- Tightening specification: 20 Nm.
- Remove the - 3359- and the Crankshaft Stop - T10050- .
- Turn the crankshaft at least two additional turns in the direction of engine rotation and just before TDC for cylinder 1.
- Position the Crankshaft Stop - T10050- on the crankshaft toothed belt sprocket again.
- Now rotate the crankshaft in the direction of engine rotation until the crankshaft stop pin -arrow- engages in the sealing flange from the rotational movement.



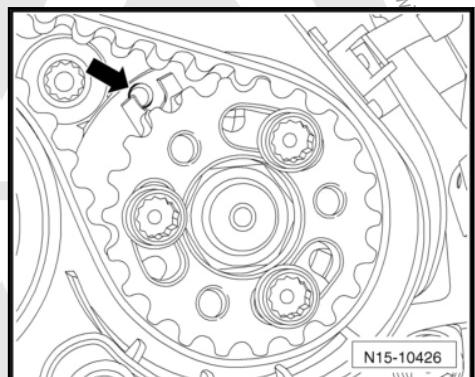
### Note

*In the following check, only the camshaft and crankshaft are secured. The high pressure fuel pump hub mounting point is very difficult to recover. A small variance -arrow- does not affect engine operation.*

- Check if:
- The camshaft hub can be locked with the - 3359- .
- The tensioning roller indicator points to the center or maximum 5 mm to the right of the gap in the base plate.

#### If the Camshaft Hub Cannot be Secured:

- Pull the - T10050- toward the back until the pin opens the hole.
- Rotate the crankshaft opposite the direction of engine rotation until it is slightly past TDC.
- Now rotate the crankshaft slowly in the direction of engine rotation until the camshaft hub can be secured.
- After securing, loosen the bolts on the camshaft toothed belt sprocket.



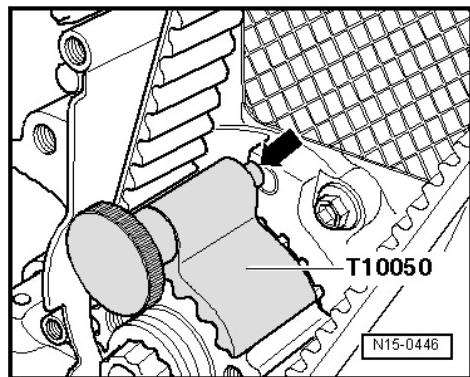
#### If the Crankshaft Stop - T10050- Pin is to the Left of the Hole:



- Turn the crankshaft in direction of engine rotation until the crankshaft stop tab engages the sealing flange.
- Tighten the camshaft toothed belt sprocket bolts.
- Tightening specification: 20 Nm.

**If the -T10050- Pin is to the Right of the Hole:**

- Rotate the crankshaft slightly opposite the direction of engine rotation.
- Now turn the crankshaft in the direction of engine rotation until the crankshaft stop pin engages the sealing flange.
- Tighten the camshaft toothed belt sprocket bolts.
- Tightening specification: 20 Nm.

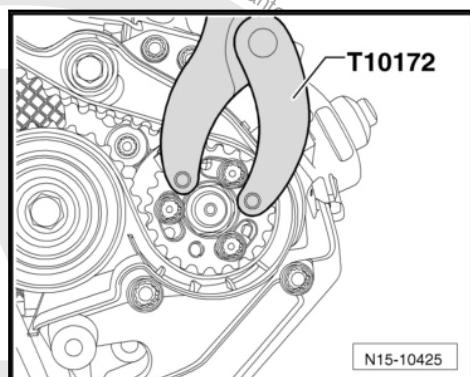


**Continuation**

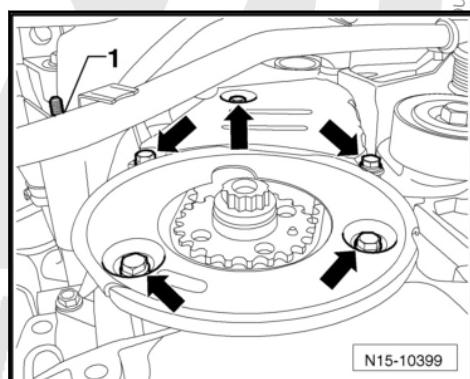
- Remove the - 3359- and the - T10050- .
- Turn the crankshaft at least two additional turns in the direction of engine rotation and just before TDC for cylinder 1.
- Check again.

**The Camshaft Hub Can now be Secured:**

- Tighten the bolts as follows:
  - Camshaft toothed belt sprocket:  $\frac{1}{8}$  ( $45^\circ$ ) additional turn.  
Counterhold with -T10172A- and -T10172/4- .



- Install the toothed belt guard lower section and center section -arrows-.
- Tightening specification. Refer to -Item 27- [⇒ Item 27 \(page 83\)](#) .
- Install the belt pulley/vibration damper.
- Tightening specification. Refer to -Item 28- [⇒ Item 28 \(page 83\)](#) .
- Install the ribbed belt. Refer to [⇒ “1.3 Ribbed Belt, Removing and Installing”, page 42](#) .
- Install the toothed belt guard upper section.



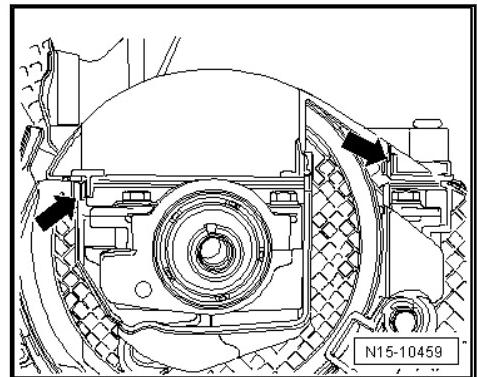


- Make sure the toothed belt guard upper section is clipped into the cylinder head cover correctly.



*The camshaft is removed here for clarity.*

- Press the toothed belt guard upper section near the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.
- Check the clearance between the hub and the toothed belt guard upper section.
- Install the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66 ; Wheel Housing Liner .
- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Body Front, Noise Insulation; Overview - Noise Insulation .



Further assembly is performed in the reverse order of the removal. Note the following:

- Route the fuel hoses without kinks.
- Check the fuel hoses for secure fit.
- Do not interchange the supply and return lines (the return line is blue or has a blue marking, the supply line is white or has a white marking).
- Clip the fuel hoses back into the retainers.
- Install the Auxiliary Fuel Pump - V393- . Refer to ⇒ [“6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing”, page 236](#) .
- Install the fuel filter. Refer to ⇒ [“6.3 Fuel Filter, Removing and Installing”, page 229](#) .
- Install the engine cover. Refer to ⇒ [“1.6 Engine Cover, Removing and Installing”, page 87](#) .

## 1.9 Cylinder Head, Removing and Installing

⇒ [“1.9.1 Cylinder Head, Removing and Installing”, page 99](#) .

### 1.9.1 Cylinder Head, Removing and Installing

Special tools and workshop equipment required

- ◆ Guide Tool - Cylinder Head - 3070-
- ◆ Diesel Injection Pump Locking Pin - 3359-
- ◆ Crankshaft Stop - T10050-
- ◆ Counterhold - Camshaft Gear - T10051-
- ◆ Puller - Camshaft Sprocket - T10052-
- ◆ Socket - Xzn 10 - T10385-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ Shop Crane - Drip Tray - VAS6208-



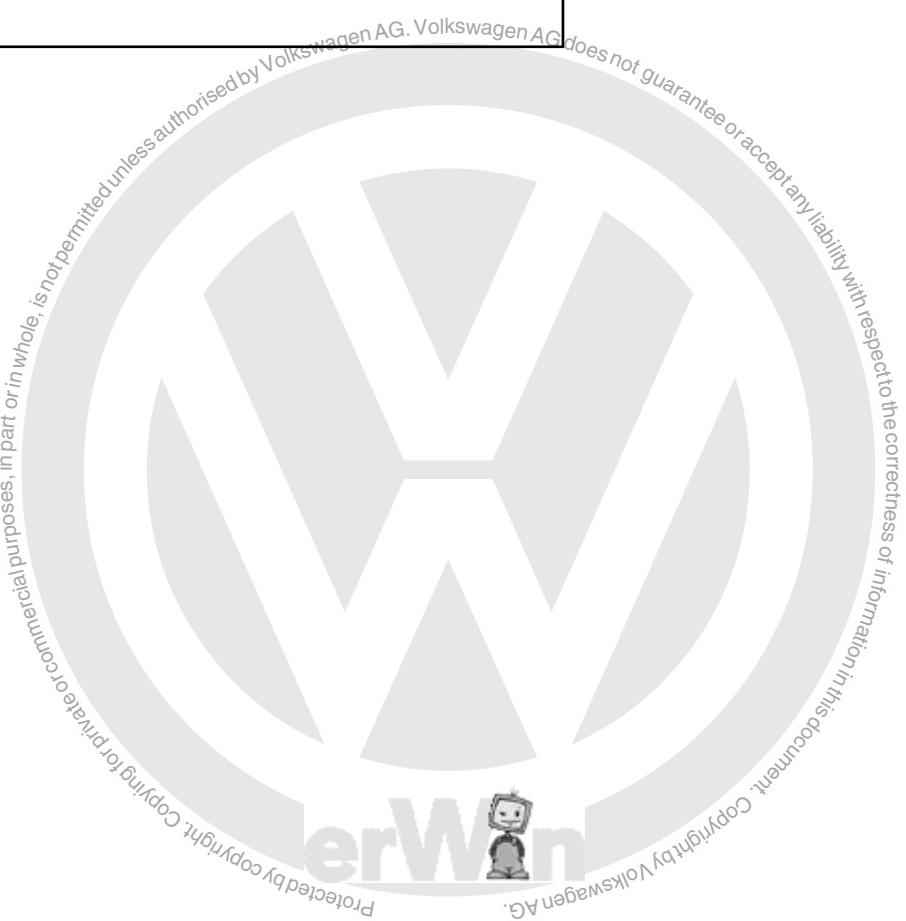
- ◆ Engine Bung Set - VAS6122- (not illustrated)



**DANGER!**

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).*

*Always pay attention to these instructions before and during work.*





### Note

- ◆ Overview - *Toothed Belt Drive*. Refer to [“1.3 Overview - Toothed Belt Drive”, page 81](#).
- ◆ Overview - *Cylinder Head Cover*. Refer to [“1.1 Overview - Cylinder Head Cover”, page 76](#).
- ◆ Overview - *Cylinder Head*. Refer to [“1.2 Overview - Cylinder Head”, page 78](#).
- ◆ Overview - *Turbocharger with Exhaust Manifold and Attachments*. Refer to [“3.2 Overview - Turbocharger with Exhaust Manifold and Attachments”, page 244](#).
- ◆ Overview - *Charge Air Cooler Components*. Refer to [“4.2 Overview - Charge Air Cooler Components”, page 265](#).
- ◆ Overview - *Intake Manifold with Attachments*. Refer to [“3.13 Overview - Intake Manifold with Attachments”, page 307](#).
- ◆ Overview - *Particulate Filter with NOx Reduction Catalytic Converter*. Refer to [“1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 336](#).
- ◆ Overview - *EGR Components*. Refer to [“3.1.1 Overview - Exhaust Gas Recirculation, Engine Codes CBDA, CBDB, CEGA”, page 378](#).
- ◆ Hose connections are secured with either spring or hose clamps.
- ◆ Always replace clamp-type clips with spring-type clips.
- ◆ -VAS6362- or the -VAS6340- are recommended for installing spring clips.
- ◆ All cable ties which are opened or cut open when removing cylinder head, must be replaced in the same position when installing cylinder head.
- ◆ When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.
- ◆ Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.
- ◆ After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.
- ◆ Always replace the self-locking nuts, seals, gaskets and clamps.

### Removing



### Note

The Battery - A- ground cable must be disconnected for the following procedure. For this reason check if a coded radio is installed. If necessary, obtain anti-theft code beforehand.



### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations.*
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*

- Remove the engine cover. Refer to [“1.6 Engine Cover, Removing and Installing”, page 87](#).
- Remove the air filter housing. Refer to [“3.15 Overview - Air Filter”, page 311](#).

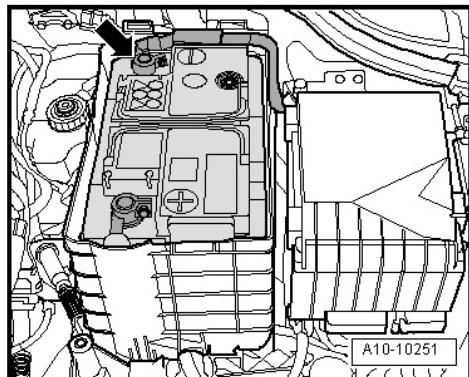


### Caution

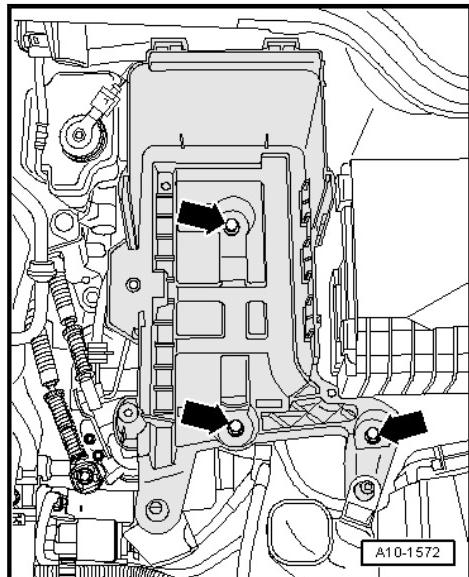
*Electronic components could be destroyed when the Battery - A- is disconnected:*

- ◆ *Complete the steps for disconnecting the Battery - A- .*

- When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to [“Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting”](#).

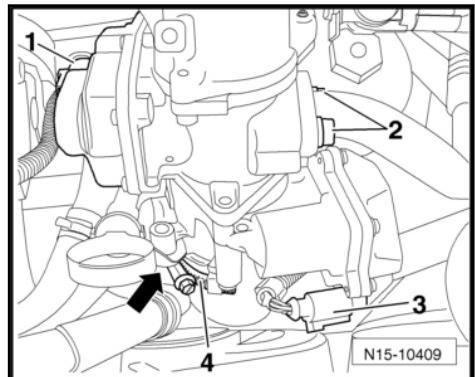


- Remove the Battery - A- and the battery tray -arrows-.
- Remove the cylinder head cover. Refer to [“1.7 Cylinder Head Cover, Removing and Installing”, page 87](#).
- Remove the toothed belt from the camshaft. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#), Toothed Belt, Removing, Installing and Tensioning.
- Remove the camshaft sprocket and the hub. Refer to [“2.2 Camshafts, Removing and Installing”, page 127](#), Camshafts, Removing and installing.

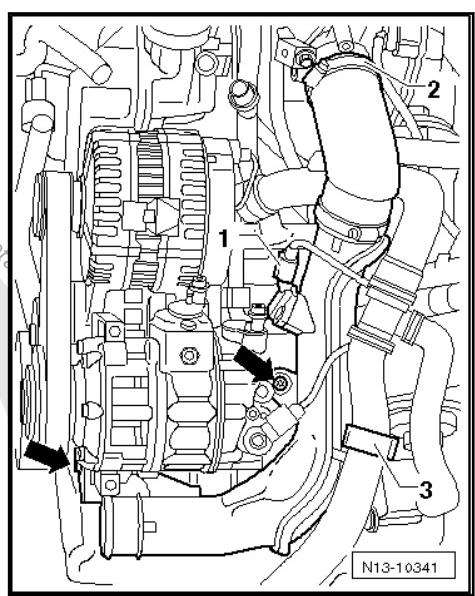




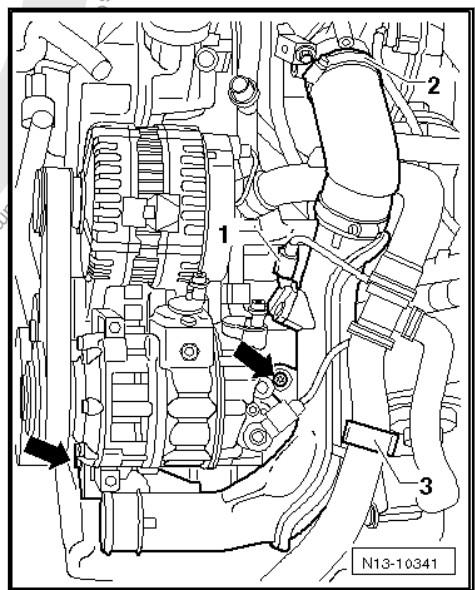
- Disconnect from the EGR Vacuum Regulator Solenoid Valve - N18- -1- and from the Throttle Valve Control Module - J338- -3-.
- Loosen the clamp -4- and remove the charge air hose.
- Remove the oil dipstick bracket -arrow-.
- Remove the air shroud and radiator fans. Refer to [“1.5 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177, Removing and Installing”, page 188](#).



- Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .

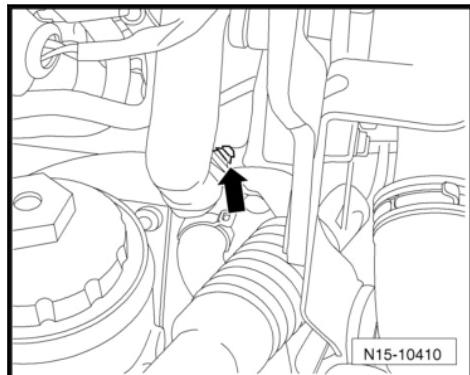


- Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.
- Remove the oil supply line. Refer to [“4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 169](#) .

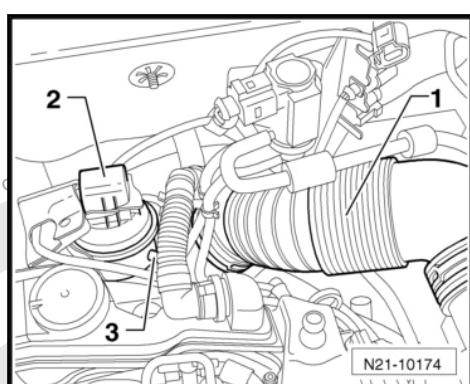




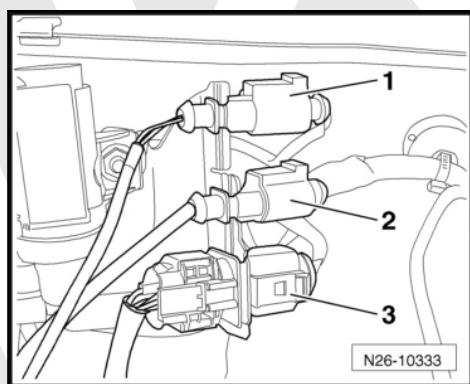
- Unclip the wiring harness to the Engine Control Module - J623- from the cable guide -arrow-.
- Remove the vacuum pump. Refer to ⇒ “[1.10 Vacuum Pump, Removing and Installing](#)”, page 122 .



- Disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -2- on the on the turbocharger vacuum dia-phragm.
- Disconnect the vacuum hose -3- at the turbocharger vacuum diaphragm.

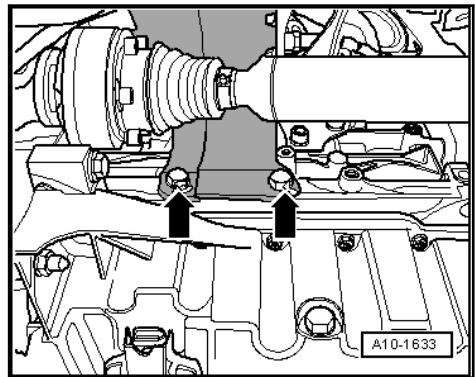


- Disconnect the »black« connector for the Exhäuser Gas Temperature Sensor 1 - G235- -2- at the plenum chamber bulk-head.
- Guide the wire out of the retainer on the plenum chamber bulkhead and on the turbocharger.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .





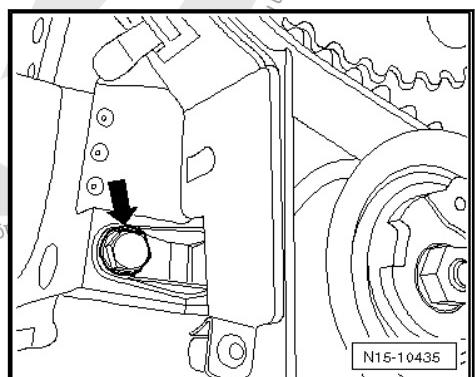
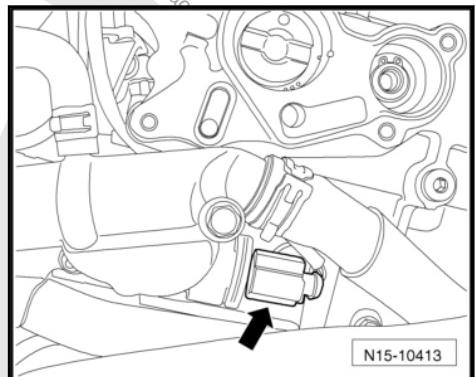
- Remove the right drive axle heat shield -arrows-.
- Remove the charge air pipe bolts -Item 15- [⇒ Item 15 \(page 266\)](#) and remove the connecting hose -Item 13- [⇒ Item 13 \(page 266\)](#) from the pulsation damper on the turbocharger.
- Mark the installation position for the Exhaust Gas Temperature Sensor 1 - G235- -Item 37- [⇒ Item 37 \(page 247\)](#) and remove it.
- Unbutton the heat shield and disconnect the connector from the Exhaust Pressure Sensor 1 - G450- . Refer to [⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#) .
- Remove the control line between the EGR housing and the Exhaust Pressure Sensor 1 - G450- . Refer to [⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#) .
- Remove the bolts and bracket with the Exhaust Pressure Sensor 1 - G450- and lay them aside (the control wire to the particulate filter remains connected).
- Remove the lower bracket for the particulate filter.



 Note

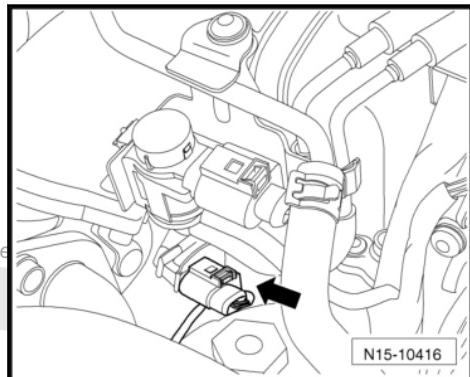
*Remove the nuts above the bracket with the -T10384- .*

- Remove the exhaust gas recirculation filter -Item 9- [⇒ Item 9 \(page 380\)](#) .
- Disconnect the connector -arrow- from the Engine Coolant Temperature Sensor - G62- and guide the wire out.
- Remove the particulate filter from the upper bracket and loosen the bracket on the cylinder head.
- Remove the clamp between the particulate filter and turbocharger.
- Remove the banjo bolt -Item 24- [⇒ Item 24 \(page 246\)](#) from the turbocharger support.
- Remove the hex bolt -Item 17- [⇒ Item 17 \(page 246\)](#) from the turbocharger support.
- Rotate the lower section of the support 90° and remove the support downward from the upper section.
- Remove the coolant hoses from the coolant connections on the cylinder head.
- Remove the bolt -arrow- from the rear toothed belt guard.
- Remove the nut -Item 5- [⇒ Item 5 \(page 82\)](#) from the toothed belt tensioning roller -Item 7- [⇒ Item 7 \(page 82\)](#) .





- Disconnect the connector for the Camshaft Position Sensor - G40- -arrow-.
- Drain the coolant. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).

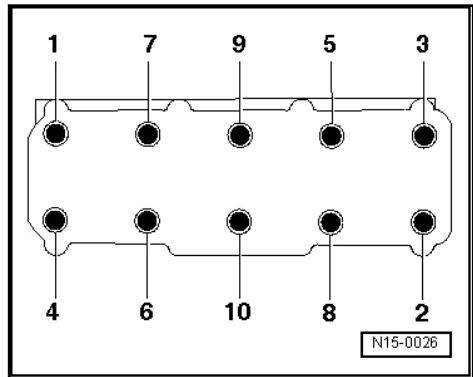




- Remove the cylinder head bolts in the sequence -1 to 10-.

**Note**

- ◆ A second technician is needed when removing the cylinder head.
- ◆ The toothed belt tensioning roller is pulled off the stud bolt when prying the cylinder head out.
- ◆ The oil return pipe on the turbocharger is pulled out of the support when removing the cylinder head.
- ◆ Make sure all necessary lines are loosened.



- Lift the cylinder head first on the transmission side and guide it out of the rear toothed belt guard. Be careful not to let the toothed belt tensioning roller fall.
- Lay the cylinder head down so that the oil return pipe is not bent. Place a wooden block under the exhaust manifold if necessary.

### Installing



#### Caution

*There is a risk of damaging sealing surfaces:*

- ◆ Carefully remove the sealant residue from the cylinder head and cylinder block.
- ◆ Make sure that no long grooves or scratches result.

*Risk of damaging the cylinder block:*

- ◆ There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.

*Risk of the cylinder head gasket leaking:*

- ◆ Carefully remove all lapping and sanding residue.
- ◆ Only unpack the new cylinder head gasket immediately before installing.
- ◆ To prevent the cylinder head gasket silicone layer and recessed area from being damaged, always handle the seal extremely carefully.

*Risk of damaging open valves:*

- ◆ If a replacement cylinder head is installed, only remove the accompanying plastic base immediately before installing to protect the open valves.

*Risk of damaging valves and piston heads after working on the valvetrain:*

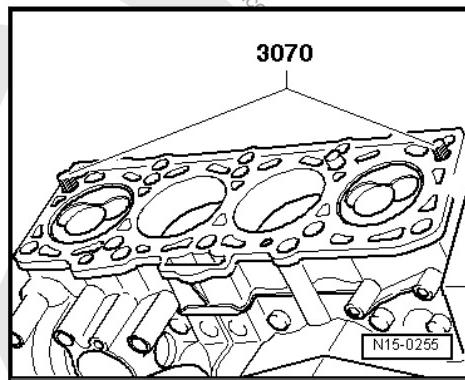
- ◆ To ensure valves do not strike pistons when starting, carefully rotate engine at least two full revolutions.
- ◆ Before installing, check if the oil return pipe decoupling element is bent or stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return pipe before installing the cylinder head.



Note

- ◆ Always replace cylinder head bolts.
- ◆ Replace gaskets, seals and self-locking nuts and clamps.
- ◆ Carefully remove residual sealant from cylinder head and cylinder block. Make sure that no long grooves or scratches result. When using sand paper, grit must not be below 100.
- ◆ Thoroughly remove all sanding and lapping residue.
- ◆ Only unpack the new cylinder head gasket immediately before installing.

- Before mounting the cylinder head, remove the -T10050- and rotate the crankshaft back opposite the direction of engine rotation until all of the pistons are nearly even under TDC.
- Place the cylinder head gasket with the identification upward.
- To center, slide the -3070- into the outer holes on the intake side.



Note

The tensioning roller must be placed on the stud bolt when mounting the cylinder head.

- Install the cylinder head, insert the eight cylinder head bolts and tighten them by hand.
- Remove the Guide Pins using the Pin Remover from the -3070- through the bolt holes and insert the cylinder head bolts.
- Tighten the cylinder head in the tightening sequence, in four stages as follows:

1 - Tighten Using Torque Wrench:

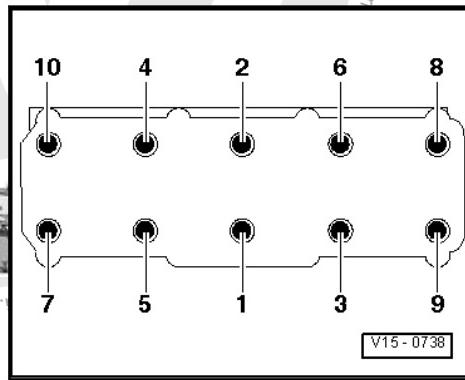
Step I = 35 Nm

Step II = 60 Nm

2 - Tighten Further Using a Solid Wrench:

Step III =  $\frac{1}{4}$  (90 °) turn

Step IV =  $\frac{1}{4}$  (90 °) turn



- Secure the toothed belt guard on the back of the cylinder head.
- Tightening specification -Item 14- [⇒ Item 14 \(page 82\)](#).
- Install the hub and the camshaft sprocket. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#), Camshafts, Removing and installing.
- Secure the camshaft and the high pressure fuel pump with the - 3359- .



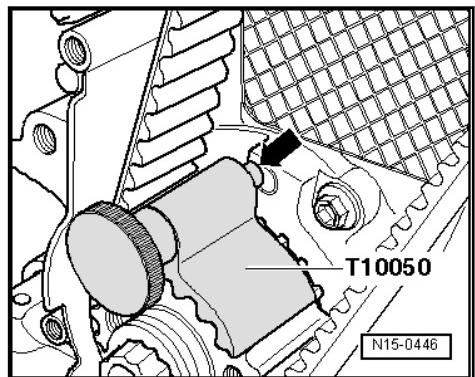
- Turn the crankshaft in the direction of engine rotation to TDC and secure the crankshaft with the -T10050- .
- Installing and tensioning the toothed belt. Refer to ["1.8 Toothed Belt, Removing, Installing and Tensioning", page 92](#) .

The Additional Numbered Procedures Must Be Followed to Ensure the Particulate Filter with the NOx Reduction Catalytic Converter Is Installed without Tension:



**Note**

- ◆ After installing the particulate filter with NOx reduction catalytic converter, make sure it is not under stress.
- ◆ Always replace the self-locking nuts, seals, gaskets and clamps.



**Caution**

*There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:*

- ◆ Do not bend the decoupling element more than 10°.
- ◆ Do not stretch the decoupling element.
- ◆ Do not damage the wire mesh on the decoupling element.

1. Position the lower bracket with the nuts on the cylinder block and on the particulate filter. (Do not tighten the nuts.)
2. Position the new clamp with a new gasket between the particulate filter and turbocharger (do not tighten the clamp):
  - Make sure the clamp is in the correct installation position. Refer to ["1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#) .
3. Install the EGR filter -Item 9- [Item 9 \(page 380\)](#) .
4. Position a new clamp between the particulate filter and EGR filter (do not tighten the clamp):
  - Make sure the clamp is in the correct installation position. Refer to ["1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#) .
5. Position the particulate filter on the upper bracket with the bolt. (Do not tighten the bolt.)
  - Tighten the mounting elements in the following sequence:
    6. Clamp between the particulate filter and turbocharger.
    7. Lower bracket to the cylinder block:
    8. Lower bracket to the particulate filter:
    9. Upper bracket to the particulate filter:
    10. Upper bracket to the cylinder head:
    11. Clamp between the particulate filter and EGR filter.



- Tightening specifications. Refer to [“1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 336](#).

Further installation is the reverse order of removal. Note the following:

- The self-locking nuts and seals must be replaced.
- Position the charge air pipe connecting hose before securing the turbocharger.
- Pay attention to the installation position of the Exhaust Gas Temperature Sensor 1 - G235- .
- Replace the banjo bolt with the turbocharger support gas-kets as well as the oil return pipe O-rings.
- Do not stretch the oil return pipe decoupling element when installing the turbocharger support.
- Make sure the line connections are secure.
- Install the cylinder head cover. Refer to [“1.7 Cylinder Head Cover, Removing and Installing”, page 87](#).





- Install the right drive axle heat shield -arrows-.

Vehicles with Manual Transmission:

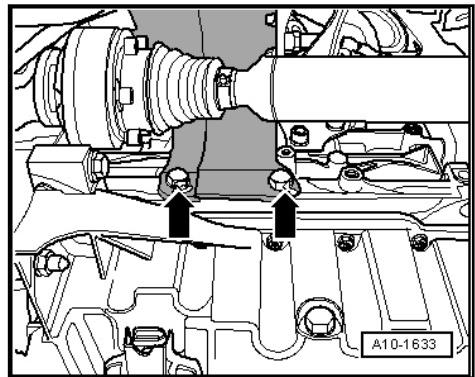
- Tightening specification. Refer to ⇒ 6-speed Manual Transmission 02Q; Rep. Gr. 34 .

Vehicles with DSG® transmission:

- Tightening specification. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

#### Tightening Specifications:

- Overview - Toothed Belt Drive. Refer to ⇒ [“1.3 Overview - Toothed Belt Drive”, page 81](#) .
- Overview - Cylinder Head Cover. Refer to ⇒ [“1.1 Overview - Cylinder Head Cover”, page 76](#) .
- Overview - Cylinder Head. Refer to ⇒ [“1.2 Overview - Cylinder Head”, page 78](#) .
- Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ⇒ [“3.2 Overview - Turbocharger with Exhaust Manifold and Attachments”, page 244](#) .
- Overview - Charge Air Cooler Components. Refer to ⇒ [“4.2 Overview - Charge Air Cooler Components”, page 265](#) .
- Overview - Intake Manifold with Attachments. Refer to ⇒ [“3.13 Overview - Intake Manifold with Attachments”, page 307](#) .
- Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to ⇒ [“1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 336](#) .
- Overview - EGR Components. Refer to ⇒ [“3.1.1 Overview - Exhaust Gas Recirculation, Engine Codes CBDA, CBDB, CEGA”, page 378](#) .



*Electrical connections and routing. Refer to ⇒ Electrical Equipment; Rep. Gr. 97.*

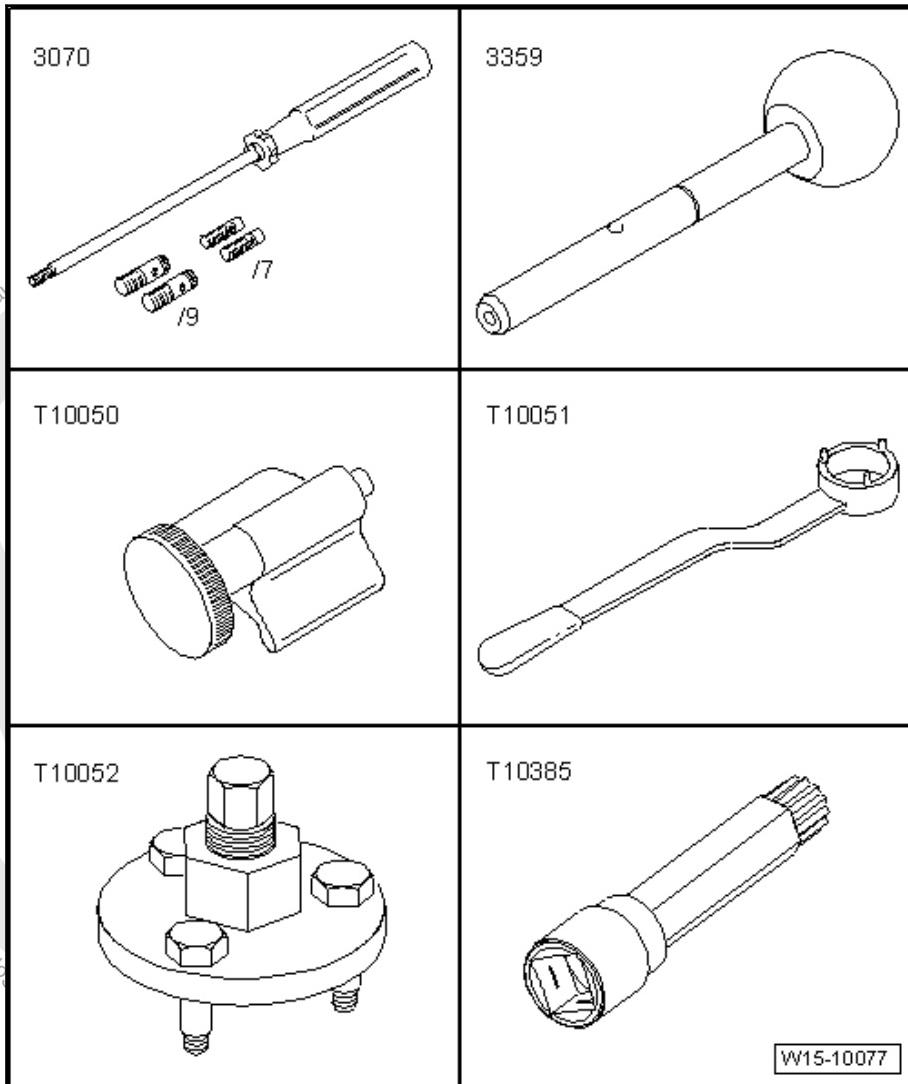
- Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .
- Fill with coolant. Refer to ⇒ [“1.10 Coolant, Draining and Filling”, page 192](#) .
- Fill the fuel system. Refer to ⇒ [“3.10 Fuel System, Filling/Bleeding”, page 304](#) .

## 1.9.2 Cylinder Head, Removing and Installing, Engine Codes CBDA, CBDB and CEGA



**Special tools and workshop equipment required**

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W15-10077

- ◆ Guide Tool - Cylinder Head - 3070-
- ◆ Diesel Injection Pump Locking Pin - 3359-
- ◆ Crankshaft Stop - T10050-
- ◆ Counterhold - Camshaft Gear - T10051-
- ◆ Puller - Camshaft Sprocket - T10052-
- ◆ Socket - Xzn 10 - T10385-



V.A.G 1331	V.A.G 1332
VAS 6208	

W15-10078

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Engine Bung Set - VAS6122- (not illustrated)



#### DANGER!

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to **"1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277**.*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to **"2 Guidelines for Clean Working Conditions", page 279**.*

*Always pay attention to these instructions before and during work.*



## Note

- ◆ Overview - *Toothed Belt Drive*. Refer to ⇒ “[1.3 Overview - Toothed Belt Drive](#)”, page 81 .
- ◆ Overview - *Cylinder Head Cover*. Refer to ⇒ “[1.1 Overview - Cylinder Head Cover](#)”, page 76 .
- ◆ Overview - *Cylinder Head*. Refer to ⇒ “[1.2 Overview - Cylinder Head](#)”, page 78 .
- ◆ Overview - *Turbocharger with Exhaust Manifold and Attachments*,. Refer to ⇒ “[3.4 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CE-GA](#)”, page 253 .
- ◆ Overview - *Charge Air Cooler Components*. Refer to ⇒ “[4.2 Overview - Charge Air Cooler Components](#)”, page 265
- ◆ Overview - *Intake Manifold with Attachments*. Refer to ⇒ “[3.13 Overview - Intake Manifold with Attachments](#)”, page 307 .
- ◆ Overview - *Front Exhaust Pipe with Particulate Filter*. Refer to ⇒ “[2.1 Overview - Front Exhaust Pipe with Particulate Filter](#)”, page 368 .
- ◆ Overview - *EGR Components*. Refer to .
- ◆ *Hose connections are secured with either spring or hose clamps*.
- ◆ *Always replace clamp-type clips with spring-type clips*.
- ◆ *-VAS6362- or the -VAS6340- are recommended for installing spring clips*.
- ◆ *All cable ties which are opened or cut open when removing cylinder head, must be replaced in the same position when installing cylinder head*.

## Removing



### WARNING

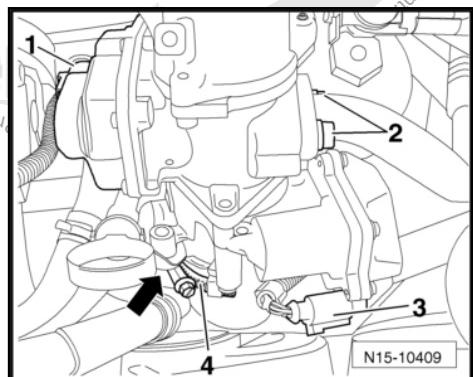
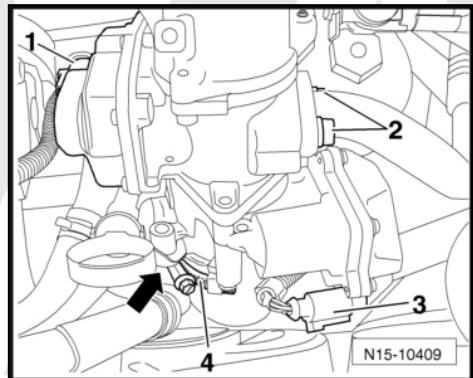
*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations*.
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines*.
- ◆ *Make sure that there is sufficient clearance to all moving or hot components*.

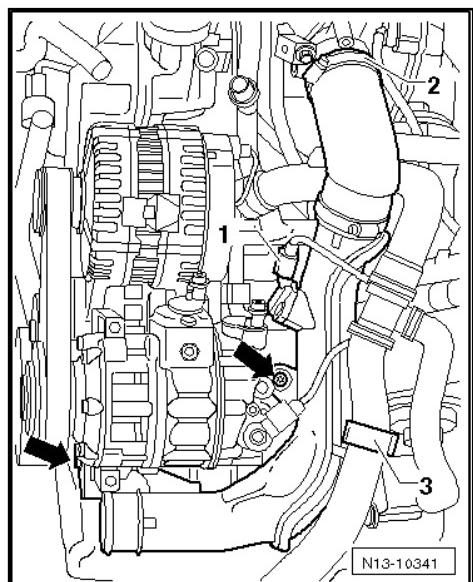
- Disconnect the battery ground cable when the ignition is switched off. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .
- Remove the engine cover. Refer to ⇒ “[1.6 Engine Cover, Removing and Installing](#)”, page 87 .
- Remove the air filter housing. Refer to ⇒ “[3.15 Overview - Air Filter](#)”, page 311 .



- Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- Remove the air shroud with the Radiator Fan - V7- and Radiator Fan 2 - V177- . Refer to ⇒ [“1.5 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”](#), page 188 .
- Remove the »cold side« hose from the chargeair cooler -Item 4- [Item 4 \(page 266\)](#) .
- Remove the cylinder head cover. Refer to ⇒ [“1.7 Cylinder Head Cover, Removing and Installing”](#), page 87 .
- Remove the toothed belt from the camshaft. Refer to ⇒ [“1.8 Toothed Belt, Removing, Installing and Tensioning”](#), page 92 .
- Disconnects from the EGR Vacuum Regulator Solenoid Valve - N18- -1- and from the Throttle Valve Control Module - J338- -3-.

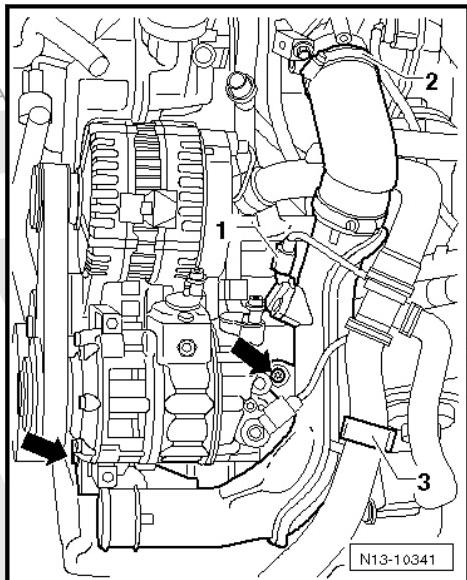


- Remove the bolts from the oil dipstick connection -arrow- and from the EGR connecting pipe -2-.
- Remove the air shroud and radiator fans. Refer to ⇒ [“1.5 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”](#), page 188 .
- Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .

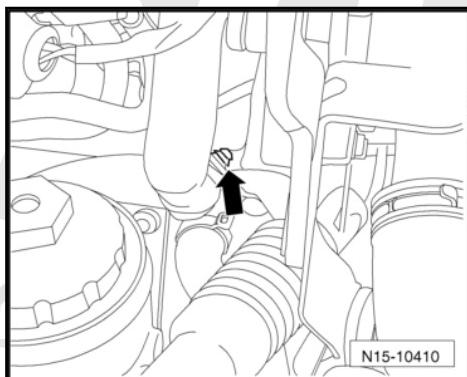




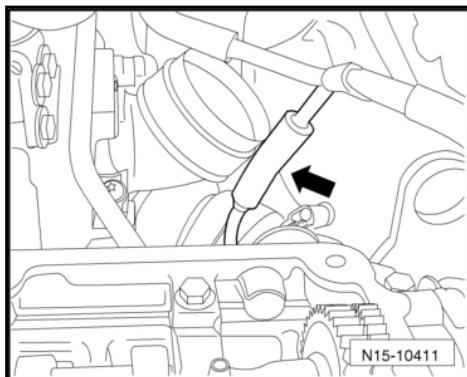
- Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.
- Disconnect the vacuum line from the vacuum pump.



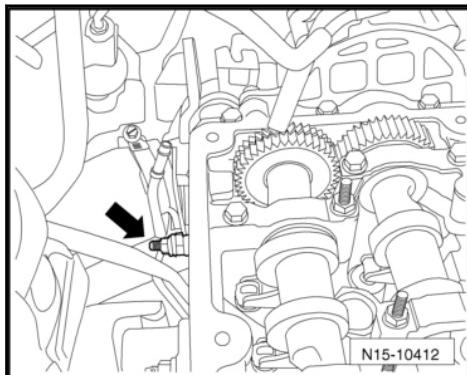
- Unclip the engine cables from the bracket -arrow-.



- Disconnect the vacuum line -arrow-.



- Remove the vacuum line connection -arrow-.
- Remove the bolts on the charge air pipe -Item 15- [⇒ Item 15 \(page 266\)](#) and remove the connecting hose from the turbocharger.
- Remove the vacuum pump from the cylinder head. Refer to [⇒ “1.10 Vacuum Pump, Removing and Installing”, page 122](#).



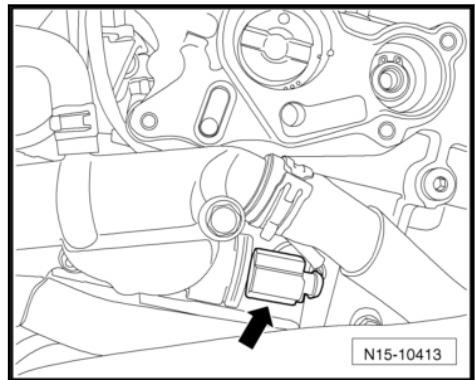


- Disconnect the connector -arrow- from the Engine Coolant Temperature Sensor - G62- and guide the wire out.



**Caution**

*Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.*



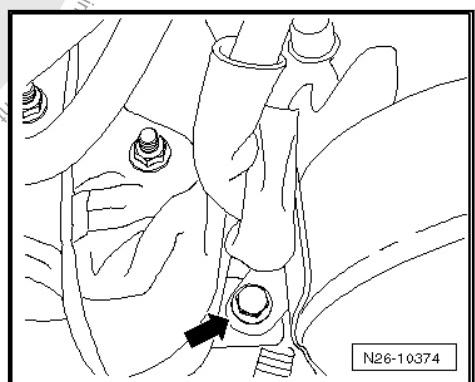
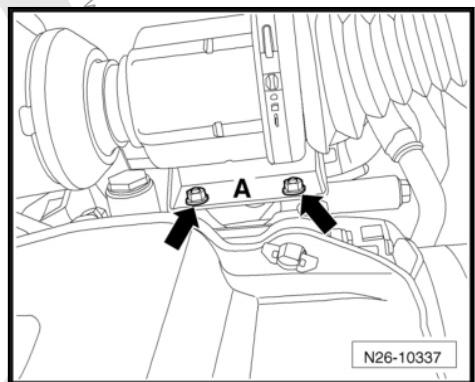
- Remove the EGR connecting pipe -Item 2- .



**Note**

*The lower bolt on the EGR cooler is removed with the - T10385- .*

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
- Drain the coolant. Refer to “1.10 Coolant, Draining and Filling” page 192 .
- Remove the nuts -arrows- on the particulate filter bracket -A- from the crankcase.
- Loosen the clamp between the turbocharger and the particulate filter.
- Remove the bolt from the bracket on the cylinder head -arrow- and move the particulate filter to the side.



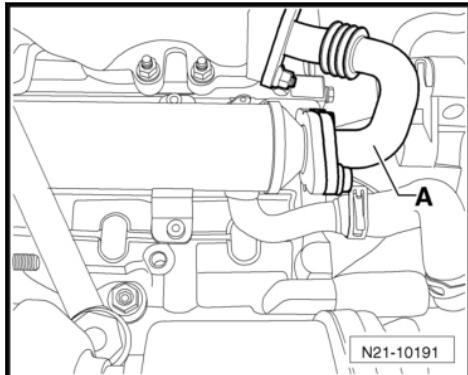


- Remove the connecting pipe -A- to the EGR cooler.

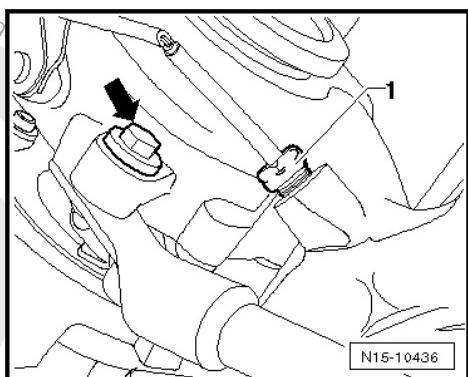


**Caution**

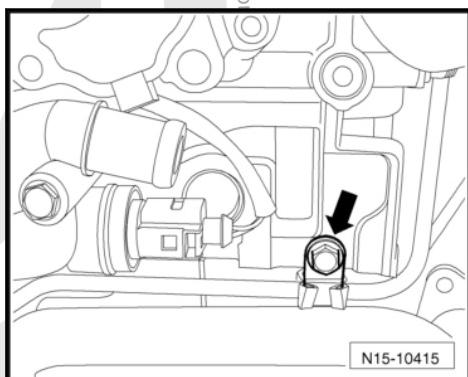
*The Exhaust Gas Temperature Sensor 1 - G235- covers the upper threaded connection on the turbocharger support and must not be bent. It may not be removed.*



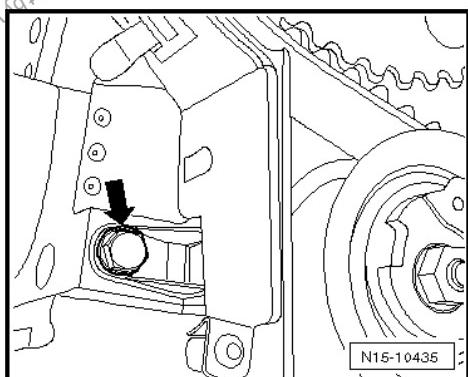
- Remove the Exhaust Gas Temperature Sensor 1 - G235-1-.



- Remove the screw -arrow- from the support on the turbocharger.
- Remove the coolant hoses from the coolant connections on the cylinder head.



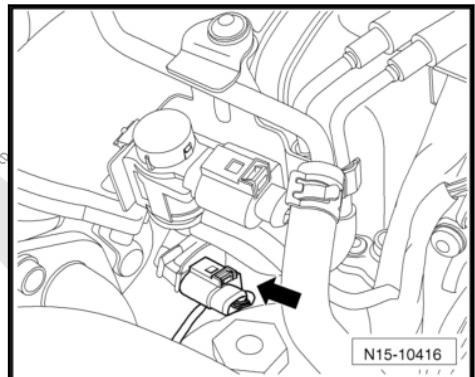
- Remove the oil supply line bolt -arrow- and then remove the oil supply line.
- Remove the camshaft toothed belt sprocket and remove the camshaft hub using the - T10052- .



- Remove the bolt -arrow- on the toothed belt guard.
- Remove the nut on the toothed belt tensioning roller.



- Disconnect the connector for the Camshaft Position Sensor - G40- -arrow-.



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- Follow the sequence when loosening the cylinder head bolts.

### Note

- ◆ A second technician is needed to remove the cylinder head.
- ◆ The toothed belt tensioning roller is pulled off the stud bolt when prying the cylinder head out.
- ◆ The turbocharger oil return line is pulled out of the support when lifting the cylinder head out.

- Lift the cylinder head first on the transmission side and guide it out of the toothed belt guard. Be careful not to let the toothed belt tensioning roller fall.
- Lay the cylinder head down so that the oil return line is not bent. Place a wooden block under the exhaust manifold if necessary.

### Installing



#### Caution

*There is a risk of damaging sealing surfaces:*

- ◆ Carefully remove the sealant residue from the cylinder head and cylinder block.
- ◆ Make sure that no long grooves or scratches result.

*Risk of damaging the cylinder block:*

- ◆ There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.

*Risk of the cylinder head gasket leaking:*

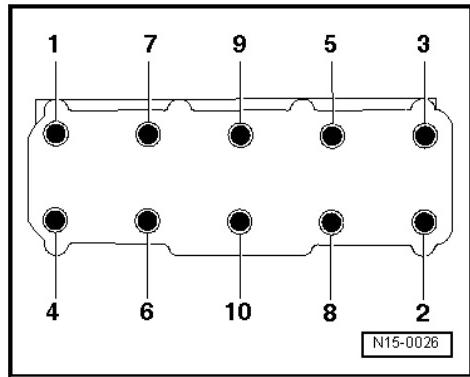
- ◆ Carefully remove all lapping and sanding residue.
- ◆ Only unpack the new cylinder head gasket immediately before installing.
- ◆ To prevent the cylinder head gasket silicone layer and recessed area from being damaged, always handle the seal extremely carefully.

*Risk of damaging open valves:*

- ◆ If a replacement cylinder head is installed, only remove the accompanying plastic base immediately before installing to protect the open valves.

*Risk of damaging valves and piston heads after working on the valvetrain:*

- ◆ To ensure valves do not strike pistons when starting, carefully rotate engine at least two full revolutions.
- ◆ Before installing, check if the oil return pipe decoupling element is bent or stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return pipe before installing the cylinder head.





### Note

- ◆ Always replace cylinder head bolts.
- ◆ Carefully remove residual sealant from cylinder head and cylinder block. Make sure that no long grooves or scratches result. When using sand paper, grit must not be below 100.
- ◆ Thoroughly remove all sanding and lapping residue.
- ◆ Only unpack the new cylinder head gasket immediately before installing.
- ◆ Handle the seal carefully. Damages to the silicone layer and in areas of recesses may result in leaks.

- Before mounting the cylinder head, remove the -T10050- and rotate the crankshaft back opposite the direction of engine rotation until all of the pistons are nearly even under TDC.
- Place the cylinder head gasket with the identification upward.
- To center, slide the -3070- into the outer holes on the intake side.



### Note

*The tensioning roller must be placed on the stud bolt when mounting the cylinder head.*

- Install the cylinder head, insert the eight cylinder head bolts and tighten them by hand.
- Remove the guide pins using the guide pin handle from Guide Tool - Cylinder Head 3070, and then insert the cylinder head bolts.
- Tighten the cylinder head in the tightening sequence, in four stages as follows:

1 - Tighten using Torque Wrench:

Step I = 30 Nm

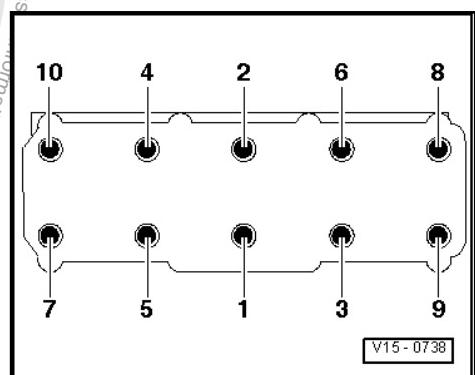
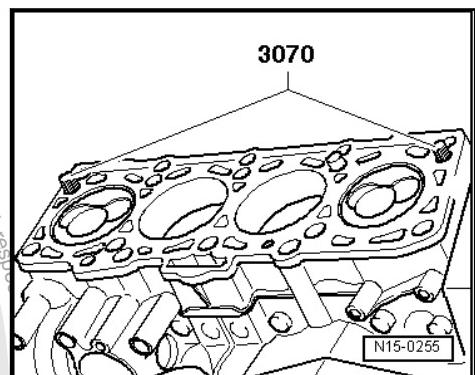
Step II = 50 Nm

2 - Tighten Further using a Solid Wrench:

Step III =  $\frac{1}{4}$  (90 °) turn

Step IV =  $\frac{1}{4}$  (90 °) turn

- Secure the rear toothed belt guard on the cylinder head.
- Install the hub and the camshaft sprocket.
- Use the - 3359- to secure the camshaft and the high pressure pump.

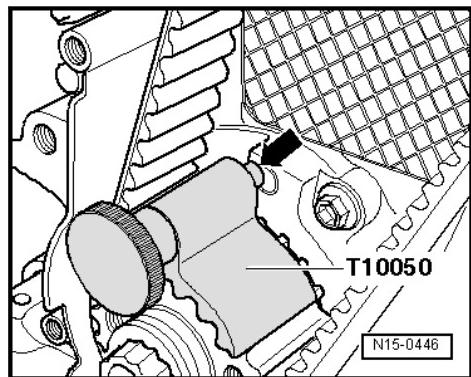




- Turn the crankshaft in the direction of engine rotation to TDC and secure the crankshaft with the -T10050- .
- Install the toothed belt. Refer to [⇒ “1.9 Belt, Removing and Installing”, page 95](#) .

Further installation is the reverse order of removal. Note the following:

- Install the cylinder head cover. Refer to [⇒ “1.7 Cylinder Head Cover, Removing and Installing”, page 87](#) .
- Install the ribbed belt. Refer to [⇒ “1.3 Ribbed Belt, Removing and Installing”, page 42](#) .
- Fill the coolant. Refer to [⇒ “1.10 Coolant, Draining and Filling”, page 192](#) .
- Perform a road test and check the DTC memory.



## 1.10 Vacuum Pump, Removing and Installation

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-



#### Note

- ◆ When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.
- ◆ Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.
- ◆ After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.
- ◆ Always replace the self-locking nuts, seals, gaskets and clamps.



#### DANGER!

*Do not disassemble the vacuum pump under any circumstances because it can cause the vacuum component to malfunction. The result would be brake booster failure.*

### Removing:

- Remove the engine cover. Refer to [⇒ “1.6 Engine Cover, Removing and Installing”, page 87](#) .
- Remove the air filter housing. Refer to [⇒ “3.15 Overview - Air Filter”, page 311](#) .

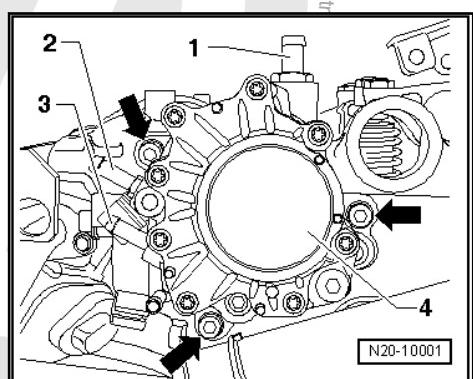
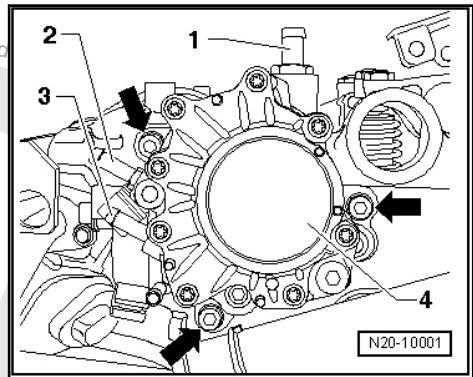


- Remove the vacuum hose -1- from the vacuum pump -4-.
- Remove the charge air pipe bolts -Item 15- [⇒ Item 15 \(page 266\)](#) and the press the charge air pipe slightly downward to reach the rear threaded connection on the vacuum pump.
- Remove the bolts -arrows-.
- Remove the vacuum pump -4- from the cylinder head.

#### Installing:

Install in reverse order of removal. Note the following:

- Make sure that vacuum pump coupling has proper seating in camshaft.
- Always replace the vacuum pump seal.
- Make sure the line connections are secure.
- Install the vacuum pump -4- and tighten the bolts -arrows-.
- Tightening specification -Item 8- [⇒ Item 8 \(page 79\)](#).
- Tighten the charge air pipe bolts -Item 15- [⇒ Item 15 \(page 266\)](#).
- Tightening specification -Item 11- [⇒ Item 11 \(page 266\)](#).
- Connect the brake booster vacuum hose -1- to the vacuum pump.
- Install the air filter housing. Refer to [⇒ “3.15 Overview - Air Filter”, page 311](#).
- Install the engine cover. Refer to [⇒ “1.6 Engine Cover, Removing and Installing”, page 87](#).



## 1.11 Compression, Checking

### Special tools and workshop equipment required

- ◆ Compression Tester Kit - Adapter 12 - VAG1381/12-
- ◆ Compression Tester Kit - VAG1763-



#### Note

The compression can also be checked. Refer to Vehicle Diagnostic Tester.

### Test Conditions

- Engine oil temperature must be at least 30 °C (86 °F).
- The battery voltage must be at least 12.7 V.
- All electrical consumers for example lamps and rear window defogger, must be switched off.

### Test Sequence

- Remove the glow plug from the applicable cylinder. Refer to [⇒ “1 Glow Plugs”, page 400](#).
- Install the -VAG1381/12- in place of the glow plugs.
- Check compression using the -VAG1763- .



**Note**

Refer to the *Operating Instructions* for information on using the tester.

- Operate the starter until the Tester shows no further pressure increase.

**Compression Values:**

- New: 25.0 to 31.0 bar (362.59 to 449.617 psi) pressure
- Wear limit: 19.0 bar (275.57 psi) pressure
- Permissible difference between all cylinders: maximum 5.0 bar (72.51 psi)
- Install the glow plug in the applicable cylinder. Refer to [“1 Glow Plugs”, page 400](#).

**Note**

By separating the connections, DTCs will be stored. After the test, check the DTC memory and erase, if necessary.

- Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester in “Guided Functions”.



## 2 Valvetrain

- ⇒ [“2.1 Overview - Valvetrain”, page 125](#)
- ⇒ [“2.2 Camshafts, Removing and Installing”, page 127](#)
- ⇒ [“2.3 Camshaft Seal, Removing and Installing”, page 133](#)
- ⇒ [“2.4 Valve Stem Seals with Cylinder Head Installed, Replacing”, page 134](#)
- ⇒ [“2.5 Valve Guides, Checking”, page 137](#)



### Note

- ◆ *Refer to*  
*The plastic protectors installed to protect the open valves must only be removed just before mounting the cylinder head.*
- ◆ *When replacing the cylinder head or cylinder head gasket, the coolant must be completely replaced.*
- ◆ *Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.*
- ◆ *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*
- ◆ *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- ◆ *Always replace the gaskets and seals.*

### 2.1 Overview - Valvetrain



#### 1 - Seal

- Do not coat the sealing lip on the seal with oil or grease
- Before installing, remove the oil residue from camshaft journal with a clean cloth
- To install, tape over the groove on the camshaft cone.
- Removing and installing. Refer to ["2.3 Camshaft Seal, Removing and Installing", page 133](#).

#### 2 - Bolt

- 10 Nm

#### 3 - Nut

- 10 Nm

#### 4 - Bearing Frame

- Observe the sequence for loosening and tightening. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#). Camshafts, Removing and Installing
- Seal with Silicone Sealant - D 176 501 A1-

#### 5 - Exhaust Camshaft

- Removing and installing. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#).

#### 6 - Intake Camshaft

- Removing and installing. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#).

#### 7 - Roller Rocker Lever

- Mark the installed position
- Do not interchange
- Check the roller bearing for ease of movement
- Lubricate the running surfaces before installing

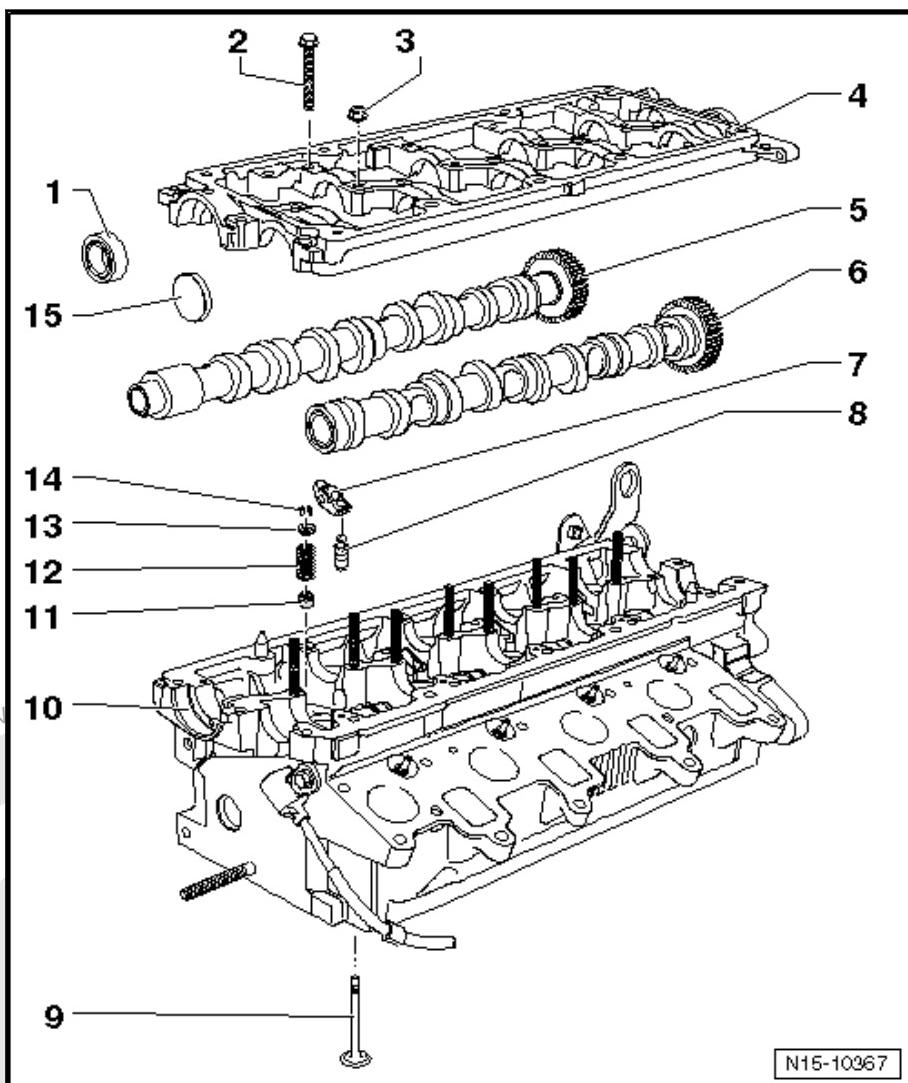
#### 8 - Hydraulic Lifter

- Mark the installed position
- Do not interchange
- Lubricate the running surfaces before installing

#### 9 - Valve

- Mark the installed position
- Do not rework, only lapping is permitted
- Valve Dimensions. Refer to [Fig. "Valve Dimensions", page 127](#).
- Valve Guides, Checking. Refer to ["2.5 Valve Guides, Checking", page 137](#).

#### 10 - Cylinder Head





- Observe the notes. Refer to [page 125](#).
- Checking for distortion. Refer to [Fig. "Cylinder Head, Checking for Distortion"](#), page 80.
- Removing and installing. Refer to ["1.9 Cylinder Head, Removing and Installing"](#), page 99.
- All of the coolant must be replaced after installing

## 11 - Valve Stem Seal

Replacing. Refer to ["2.4 Valve Stem Seals with Cylinder Head Installed, Replacing"](#), page 134.

## 12 - Valve Spring

## 13 - Valve Spring Retainer

## 14 - Cone Piece

## 15 - Cap

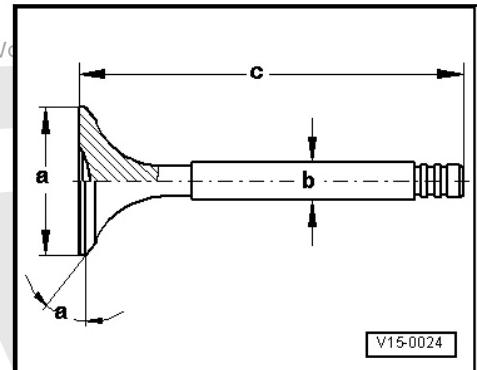
- Always replace
- Drive in flush using a suitable drift

## Valve Dimensions



### Note

*Intake and exhaust valves must not be reworked. Only lapping is permitted.*



Dimension	Intake Valve	Exhaust Valve
Diameter a mm	26.60	26.00
Diameter b mm	5.940	5.940
c mm	99.30	99.10
α °	45	45

## 2.2 Camshafts, Removing and Installing

### Special tools and workshop equipment required

- ◆ Diesel Injection Pump Locking Pin - 3359-
- ◆ Counterhold - Camshaft Gear - T10051-
- ◆ Puller - Camshaft Sprocket - T10052-
- ◆ Camshaft Fitting Tool - T40094A-
- ◆ Camshaft Fitting Tool - T40095-
- ◆ Camshaft Fitting Tool - T40096 - T40096-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear

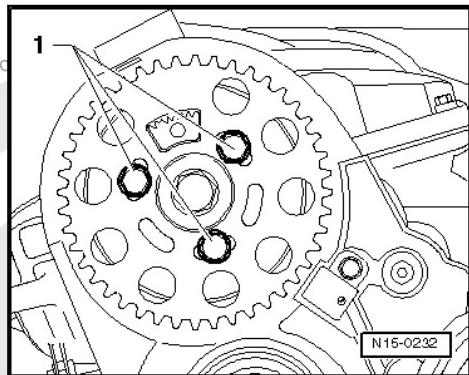


- ◆ Silicone Sealant - D 176 501 A1-

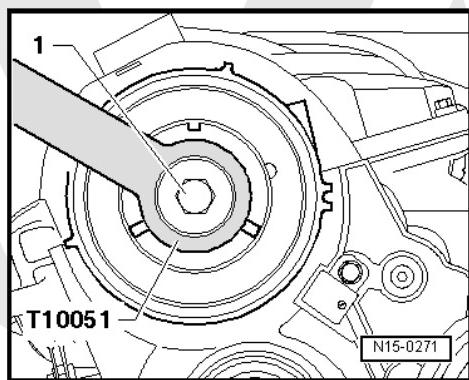
⇒ [, page 129](#).

### Removing

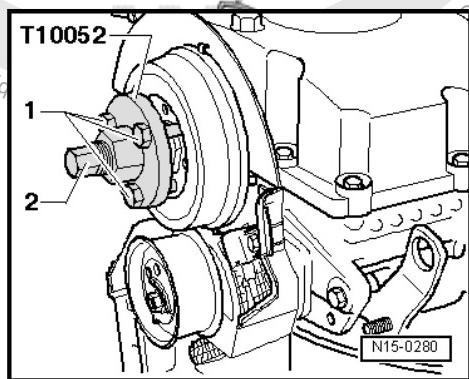
- Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to ⇒ [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#), Toothed Belt, Removing, Installing and Tensioning.
- Remove the cylinder head cover. Refer to ⇒ [“1.7 Cylinder Head Cover, Removing and Installing”, page 87](#).
- Remove the bolts -1- for camshaft sprocket.
- Remove the camshaft sprocket from the hub.



- Counterhold the hub with the -T10051- and loosen the hub bolt -1-.
- Unscrew the bolt for the hub by approximately two turns.



- Mount the - T10052- and align the Puller - Camshaft Sprocket to the holes in the hub.
- Tighten the bolts -1-.
- Tighten the Puller -2- evenly to tension the hub until the hub loosens from the camshaft cone.



*Hold the Puller at the same time with a 30 mm wrench.*

- Remove the hub from the camshaft cone.
- Remove the vacuum pump. Refer to ⇒ [“1.10 Vacuum Pump, Removing and Installing”, page 122](#).



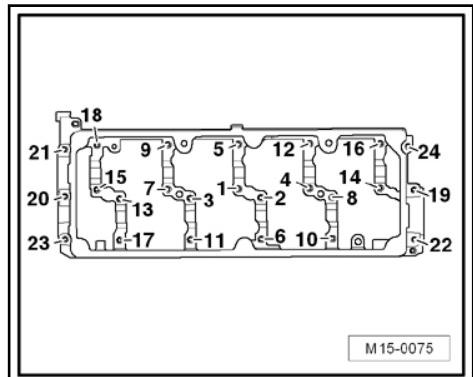
- Remove the bearing frame bolts or nuts in the sequence -24 to 1-.
- Remove the bearing frame.
- Carefully remove the camshafts.

**Installing:**



**Note**

- ◆ Note the expiration date for the Sealant .
- ◆ Seal the separating surface between the bearing frame and the cylinder head with Silicone Sealant - D 176 501 A1- .



**Caution**

- ◆ The camshafts may only be installed using the -T40094- as described below. Otherwise the axial bearing in the bearing frame will be destroyed and the cylinder head will have to be replaced.
- ◆ Make sure that no sealant residue enters the cylinder head or the bearings.



**WARNING**

*Wear protective eyewear.*

- Remove any sealant residue from the cylinder head and on the bearing frame using, for example, a rotating plastic brush.
- Clean the sealing surfaces, they must be free of oil and grease.
- Oil the contact surfaces of the camshafts.

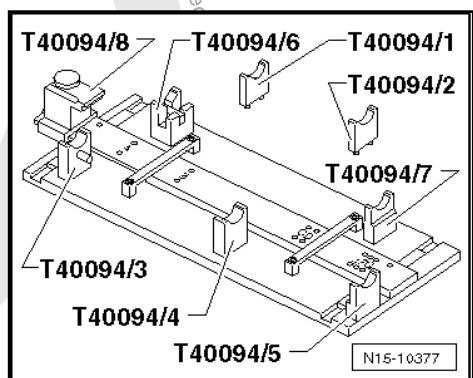
Assemble the -T40094- as follows:

- Remove the - T40094/3- , - T40094/4- and - T40094/5- from the base plate. Loosen the threaded connections from below.



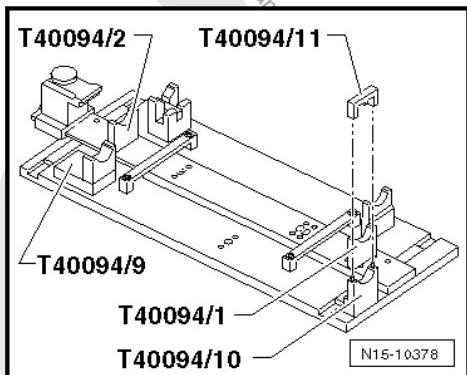
**Note**

If the - T40094A- mounts are not marked, mark the removed mounts, for example, with numbers, to assure it can be assembled later.

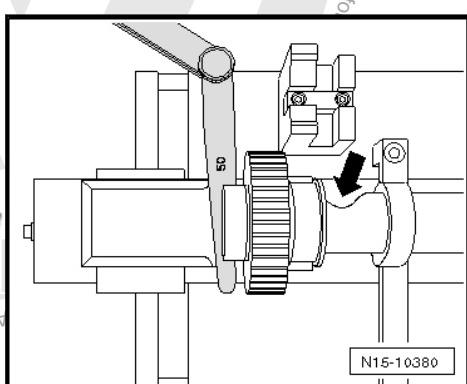




- Instead, mount the - T40094/9- and - T40094/10- in the empty outer locations.
- Place the - T40094/2- at position "A" and -T40094/1- at position "F".



- First install the intake camshaft as shown. Make sure the recess -arrow- for the cylinder head bolt faces »outward«.
- Install a 0.50 mm feeler gauge and push the - T40094/8- into the groove on the intake camshaft.
- Now insert the exhaust camshaft.

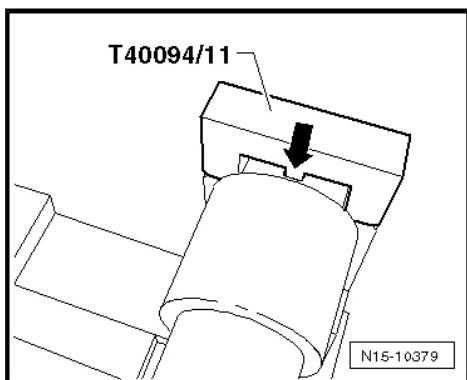


- Secure the exhaust camshaft above its groove -arrow- using the - T40094/11- .
- Mount the - T40096/1- on the exhaust camshaft gears.

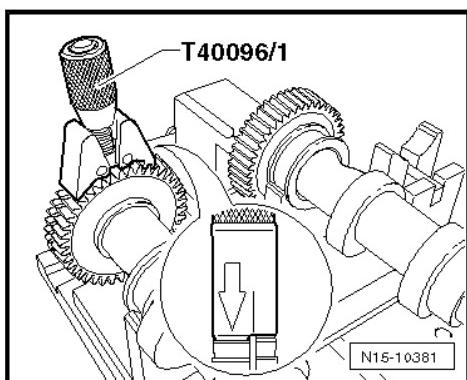


**Caution**

*Make sure the clamping bracket marked with an arrow is on the wider sprocket.*

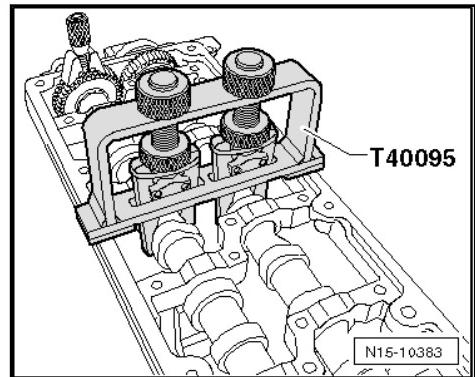


- Tighten the - T40096/1- with the thumbwheel until the tooth flanks align. If necessary use a 13 mm open end wrench.
- Slide the intake camshaft toward the exhaust camshaft until the splines are engaged.
- Position the bearing frame on the camshafts.
- All the camshaft bearings must lie on the camshafts.

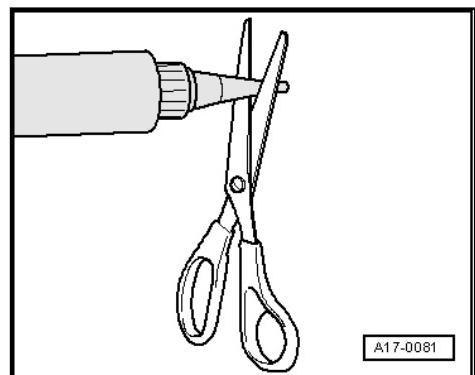




- Position the - T40095A- as shown and secure the camshafts in the bearing frame.
- Remove the -T40094/11- .
- Remove the -T40094/8- from the groove in the intake cam-shaft.



- Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).



- Apply Silicone Sealant as shown on the clean cylinder head sealing surface. The sealing compound bead must be:
  - 2 to 3 mm thick
  - Run around **inside** in the area of the bolt holes

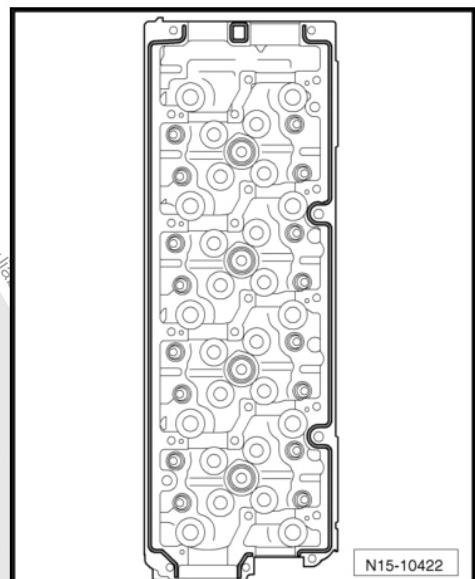


**Note**

*Sealant beads must not be thicker than 2 to 3 mm or else extra sealant can enter camshaft bearing.*

- Remove the camshafts together with the bearing frame and the - T40095- from the -T40094- .

Carefully insert the camshafts and bearing frame in the cylinder head.



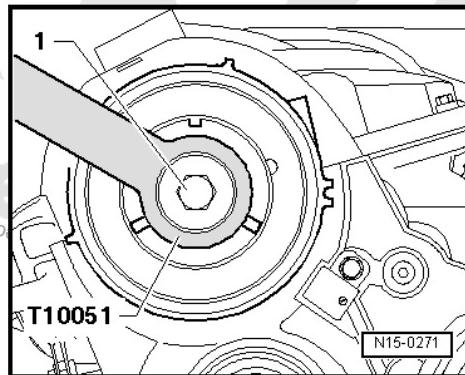
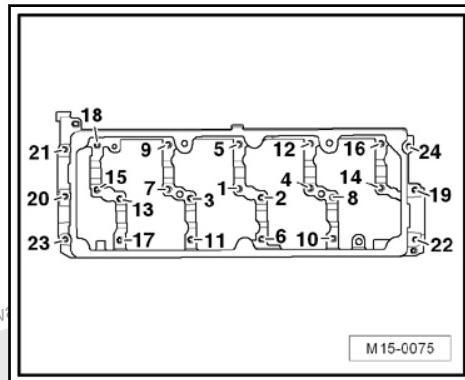


- First tighten the bearing frame bolts or nuts by hand in the sequence -1 to 24-.
- The guide frame must contact the entire contact surface of the cylinder head.
- Tighten the bearing frame bolts or nuts in the sequence -1 to 24-.
- Tightening specifications -Item 2- [⇒ Item 2 \(page 126\)](#) and -Item 3- [⇒ Item 3 \(page 126\)](#) .
- Remove the -T40095- and the -T40096/1- .
- Replace the camshaft seal. Refer to [“2.3 Camshaft Seal Removing and Installing”, page 133](#) .
- Drive a new cap -Item 15- [⇒ Item 15 \(page 127\)](#) onto the cylinder head with a suitable drift until it is flush,

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

#### Note

- ◆ *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*
  - ◆ *After working on the valvetrain, carefully rotate engine by hand at least two full revolutions to ensure that valves do not strike the pistons when starting.*
- Place the hub onto the camshaft.
  - Counterhold the hub with the -T10051- and tighten the hub bolt -1-.
  - Tightening specifications. Refer to -Item 11- [⇒ Item 11 \(page 82\)](#) .





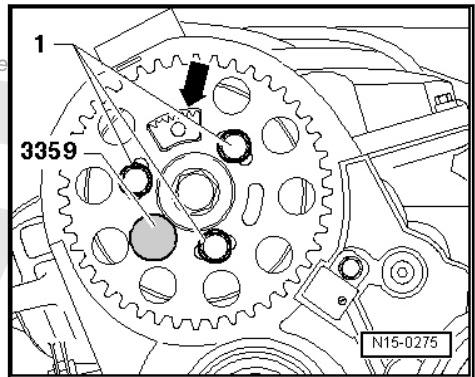
- Push the camshaft sprocket onto the hub.



#### Note

*The toothed segment -arrow- of the camshaft sprocket must face upward.*

- Install the bolts -1- into the camshaft sprocket by hand without play.
- Lock the hub with the -3359- .
- Installing and tensioning the toothed belt. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#) .
- Install the vacuum pump. Refer to [“1.10 Vacuum Pump, Removing and Installing”, page 122](#) .
- Install the cylinder head cover. Refer to [“1.7 Cylinder Head Cover, Removing and Installing”, page 87](#) .



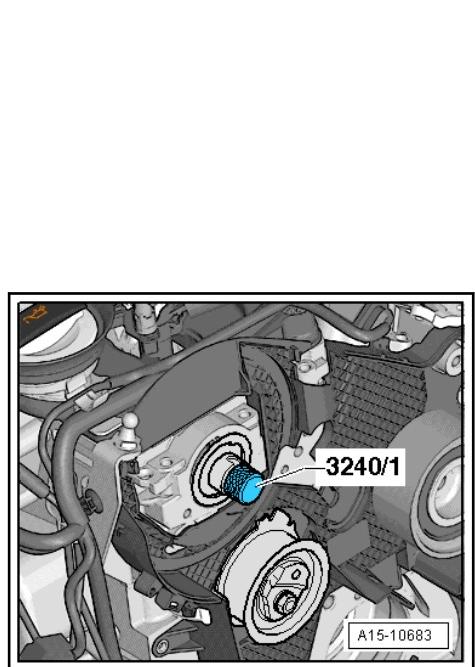
## 2.3 Camshaft Seal, Removing and Installing

### Special tools and workshop equipment required

- ◆ Seal Installer - Crankshaft/Camshaft - 10-203-
- ◆ Puller - Camshaft Seal - 3240-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ M12x65 bolt

### Removing

- Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#) , Toothed Belt, Removing, Installing and Tensioning.
- Remove the camshaft sprocket and the hub. Refer to [“2.2 Camshafts, Removing and Installing”, page 127](#) , Camshafts, Removing and installing.
- Insert the Puller - Camshaft Seal Supplement - 3240/1- into the camshaft.
- Remove the inner section of the -3240- two rotations (approximately 3 mm) from the outer section and secure with a knurled bolt.



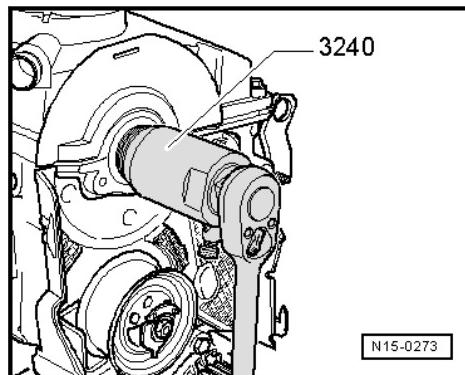


- Lubricate the threaded head on the -3240- position it and install it as far as possible into the seal using force.
- Loosen the knurled bolt and turn inner section against cam-shaft until the seal is removed.

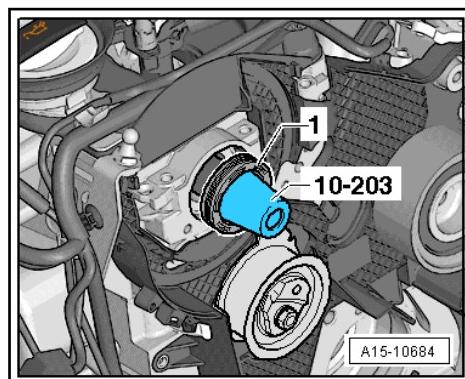
#### Installing:



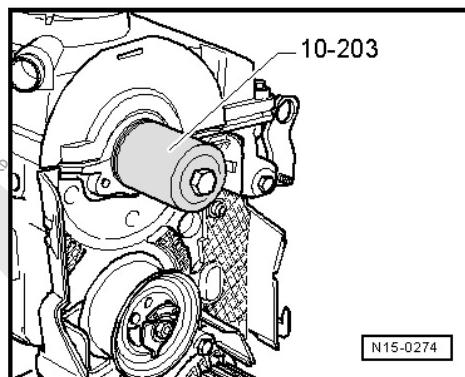
*The sealing lip of the seal may not be additionally oiled or greased.*



- Clean off any oil residue on the camshaft pin with a clean cloth.
- Mount the guide sleeve from the Puller - Camshaft Seal - 3240- on the camshaft as shown.
- Carefully slide the shaft seal -1- over the guide sleeve and onto the camshaft.



- Press the seal in the thrust piece from the - 10-203- and install the M12x65 bolt all the way.
- Install the camshaft sprocket and the hub. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#), Cam-shafts, Removing and installing.
- Installing and tensioning the toothed belt. Refer to ["1.8 Toothed Belt, Removing, Installing and Tensioning", page 92](#).



## 2.4 Valve Stem Seals with Cylinder Head Installed, Replacing

### Special tools and workshop equipment required

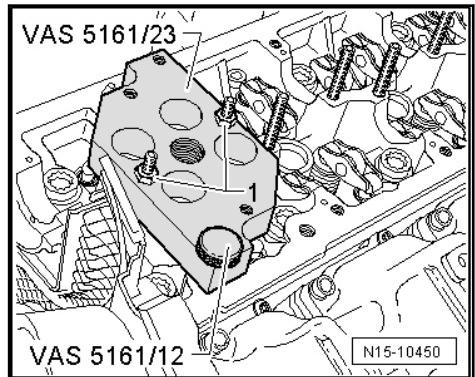
- ◆ Puller - Valve Seal - 3364-
- ◆ Seal Installer - Valve Stem - 3365-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Valve Keeper Tool Kit - VAS5161A-

### Removing:

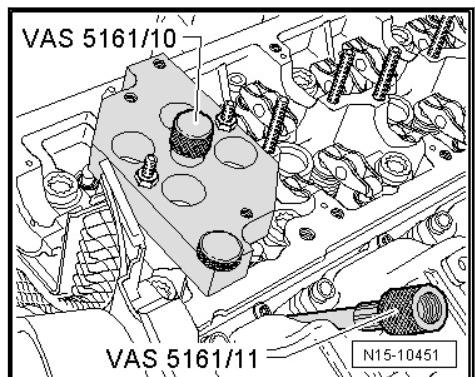
- Remove all the glow plugs. Refer to ["1 Glow Plugs", page 400](#).
- Remove the camshafts. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#).



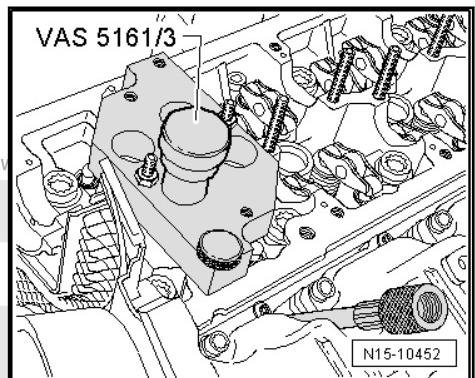
- Position the -VAS5161/23- on the cylinder head.
- Secure the Guide Plate on the intake manifold side using the -VAS5161/12- and to the stud bolts hand-tight with threadless M6 nuts -1-.



- Install the -VAS5161/10- in the Guide Plate .
- Install the -VAS5161/11- hand-tight in the respective glow plug threads.



- Insert the -VAS5161/3- into the Guide Plate and loosen the stuck valve retainers with a plastic mallet.

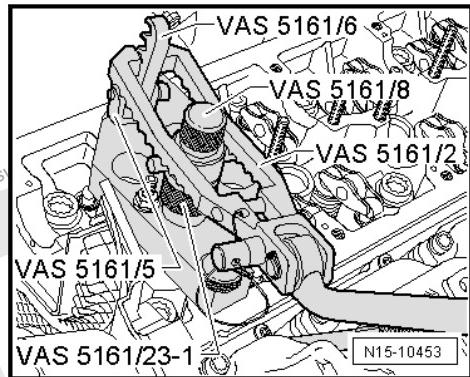


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- Install the - VAS5161/5- using the -VAS5161/6- into the Guide Plate .
- Slide the -VAS5161/23-1- onto the -VAS5161/8A- .
- Connect the - VAS5161/11- to compressed air with a commercially available connector and apply constant pressure.
- Minimum pressure: 6 bar (87.02 psi)
- Engage the -VAS5161/2- on the Valve Cotter Tool Kit Retainer and press the Assembly Cartridge downward.
- At the same time, turn the Assembly Cartridge knurled bolt to the right until the points engage in the valve retainers.
- Move the knurled bolt gently back and forth, causing the valve retainers to be pressed apart and gripped in the Assembly Cartridge .
- Release the Pressure Fork .
- Remove the Assembly Cartridge with the Knurled Spacer Ring , the valve plate and the valve spring.

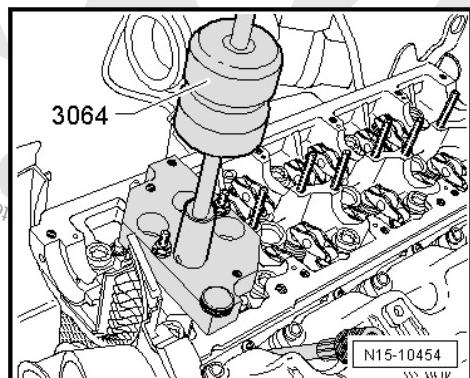


**Note**

*The -3064- is shown, the -3364- is used for removing the valve stem seals.*

- Pull off valve stem seals using the -3064- .

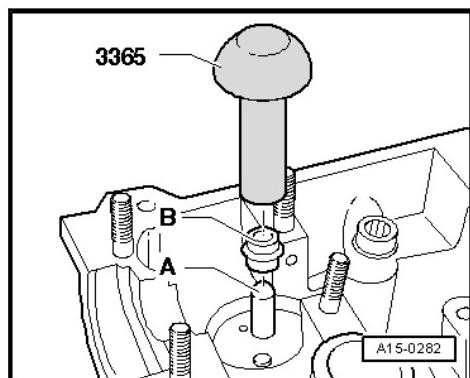
**Installing:**



**Note**

*A plastic sleeve -A- is supplied with the new valve stem seals.*

- Place the plastic sleeve -A- on valve stem to prevent damage to new valve stem seals -B-.
- Lightly oil the sealing lips of the valve stem seal -B-.
- Push the valve stem seal -B- on the plastic sleeve -A-.
- Carefully press valve stem seal onto valve guide using -3365- .
- Tap lightly on the driver with a plastic mallet until the valve stem seal is at the stop.
- Remove the plastic sleeve -A- again.
- Insert the valve spring and valve plate in the cylinder head.



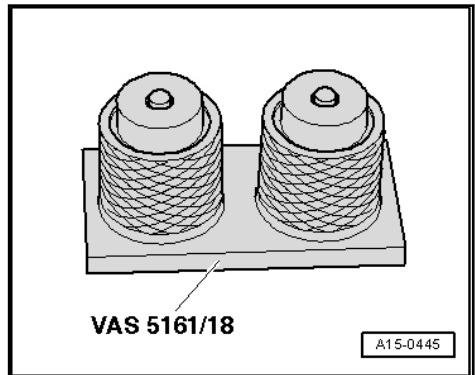


- If the valve retainers were removed from the Assembly Cartridge, they must first be inserted into the -VAS5161/18- .

**Note**

*The large diameter of the valve retainers point upward.*

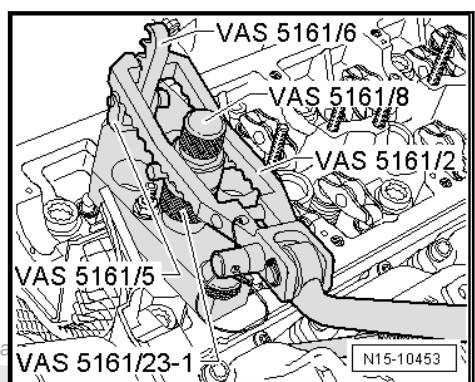
- Press the Assembly Cartridge onto the Insertion Tool from above and remove the valve retainers.



- Insert the -VAS5161/8A- in the Guide Plate .
- Press the Pressure Fork down and pull the knurled bolt upward while turning it left and right to insert the valve retainers.
- Release the Pressure Fork with the knurled bolt still tightened.

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

- Install the camshafts. Refer to ["2.2 Camshafts, Removing and Installing", page 127](#) .



**Note**

- ◆ *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*
- ◆ *After working on the valvetrain, carefully rotate engine by hand at least two full revolutions to ensure that valves do not strike the pistons when starting.*
- Install all the glow plugs. Refer to ["1 Glow Plugs", page 400](#) .

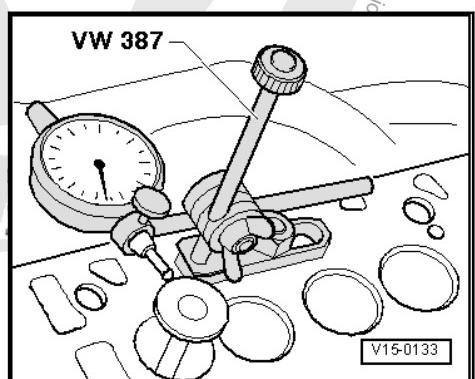
## 2.5 Valve Guides, Checking

### Special tools and workshop equipment required

- ◆ Dial Gauge Holder - VW387-
- ◆ Dial Gauge - 0-10mm - VAS6079-

### Test Sequence

- Insert a new valve into the guide. The end of the valve stem must be flush with the guide. Use only the intake valve in the intake guide or the exhaust valve in the exhaust guide.
- Determine the tilting clearance.
- Wear limit: 1.30 mm
- If the tilting clearance exceeds the wear limit, the cylinder head must be replaced.





## 17 – Lubrication

### 1 Engine Oil

⇒ [“1.1 General Information”, page 138](#)

⇒ [“1.2 Oil Capacities”, page 138](#)

⇒ [“1.3 Engine Oil, Checking Level”, page 138](#)

#### 1.1 General Information



*The oil level must not go above the MAX mark - danger of causing damage to the catalytic converter! Markings. Refer to ⇒ [“1.3 Engine Oil, Checking Level”, page 138](#).*

Draining the Engine Oil. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions; Engine Oil, Draining or Extracting and Filling, Replacing Oil Filter .

Engine Oil Specification. Refer to the ⇒ Rep. Gr. MS ; Maintenance Schedules (USA and Canada) .

#### 1.2 Oil Capacities

⇒ [“1.2.1 Engine Code CBEA”, page 138](#)

⇒ [“1.2.2 Engine Code CJAA”, page 138](#)

##### 1.2.1 Engine Code CBEA

Refer to ⇒ Rep. Gr. MS ; Fluid Capacity Tables (USA and Canada)

- If necessary, fill up to the MAX mark on the oil dipstick.  
Refer to ⇒ [“1.3 Engine Oil, Checking Level”, page 138](#) .

##### 1.2.2 Engine Code CJAA

Refer to ⇒ Rep. Gr. MS ; Fluid Capacity Tables (USA and Canada)

- If necessary, fill up to the MAX mark on the oil dipstick.  
Refer to ⇒ [“1.3 Engine Oil, Checking Level”, page 138](#) .

#### 1.3 Engine Oil, Checking Level



*The oil level must not go above the MAX mark - danger of causing damage to the catalytic converter!*

##### Test Conditions

- Engine oil temperature: minimum 60 °C (140 °F)
- Vehicle must be at a level position.
- After stopping engine, wait a few minutes to allow oil to flow back into oil pan.



### Test Sequence

- Pull out the oil dipstick, wipe off with a clean cloth and insert it all the way.
- Remove the dipstick again and check the oil level.

Range of markings on dipstick:

1 - MIN Mark

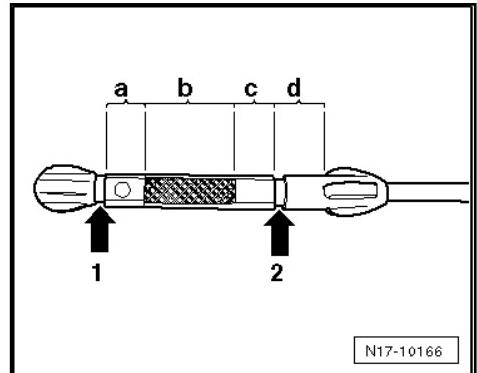
2 - MAX Mark

a - Oil level is near the MIN mark: add oil.

b - Oil level in the center: engine oil can be filled.

c - Oil level is near the MAX mark: do not add engine oil.

d - The oil level may stay at this level due to certain operating conditions.



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#### Note

*The engine oil level may stay in the -d- range due to fuel entering the oil or unfavorable operating conditions after filling. This is normal and will correct itself. Engine oil does not need to be drained.*





## 2 Lubrication System Components, Engine Code CBEA

- ⇒ “2.1 Overview - Oil Pump, Oil Pan and Balance Shaft Assembly”, page 140
- ⇒ “2.2 Oil Pan, Removing and Installing”, page 143
- ⇒ “2.3 Oil Pump, Removing and Installing”, page 145
- ⇒ “2.4 Balance Shaft Assembly, Removing and Installing”, page 146
- ⇒ “2.5 Spur Gear, Removing from Crankshaft and Shrink-Fitting New Spur Gear”, page 153



### Caution

If large quantities of metal shavings or abraded material are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent subsequent damage, perform the following steps after the repair:

- ◆ Clean the oil channels carefully
- ◆ Replace the oil spray jets
- ◆ Replace the oil cooler
- ◆ Replace the oil filter.

### 2.1 Overview - Oil Pump, Oil Pan and Balance Shaft Assembly

“Pay attention to the warnings”. Refer to ⇒ [page 140](#).

Oil spray nozzle and pressure relief valve. Refer to ⇒ [Fig. “Oil Spray Jet and Pressure Relief Valve”](#), page 143.





## 1 - Oil Pan

- Removing and installing. Refer to [“2.2 Oil Pan, Removing and Installing”, page 143](#).

## 2 - Bolt

- 10 Nm

## 3 - Intake Tube

- Clean the screen if there are debris

## 4 - Bolt

- 10 Nm

## 5 - O-Ring

- Always replace

## 6 - Oil Pump

- Removing and installing. Refer to [“2.3 Oil Pump, Removing and Installing”, page 145](#).

Before installing, check if both alignment sleeves for centering the oil pump on the balance shaft assembly are present.

## 7 - Oil Pump Input Shaft

## 8 - Circlip

- Replace damaged or stretched circlips
- Must lie in the base of the groove

## 9 - Balance Shaft Spur Gear

## 10 - Bolt

- 20 Nm + 90° (1/4) additional turn
- Always replace

## 11 - Hub

- Always replace
- For the intermediate sprocket

## 12 - Bolt

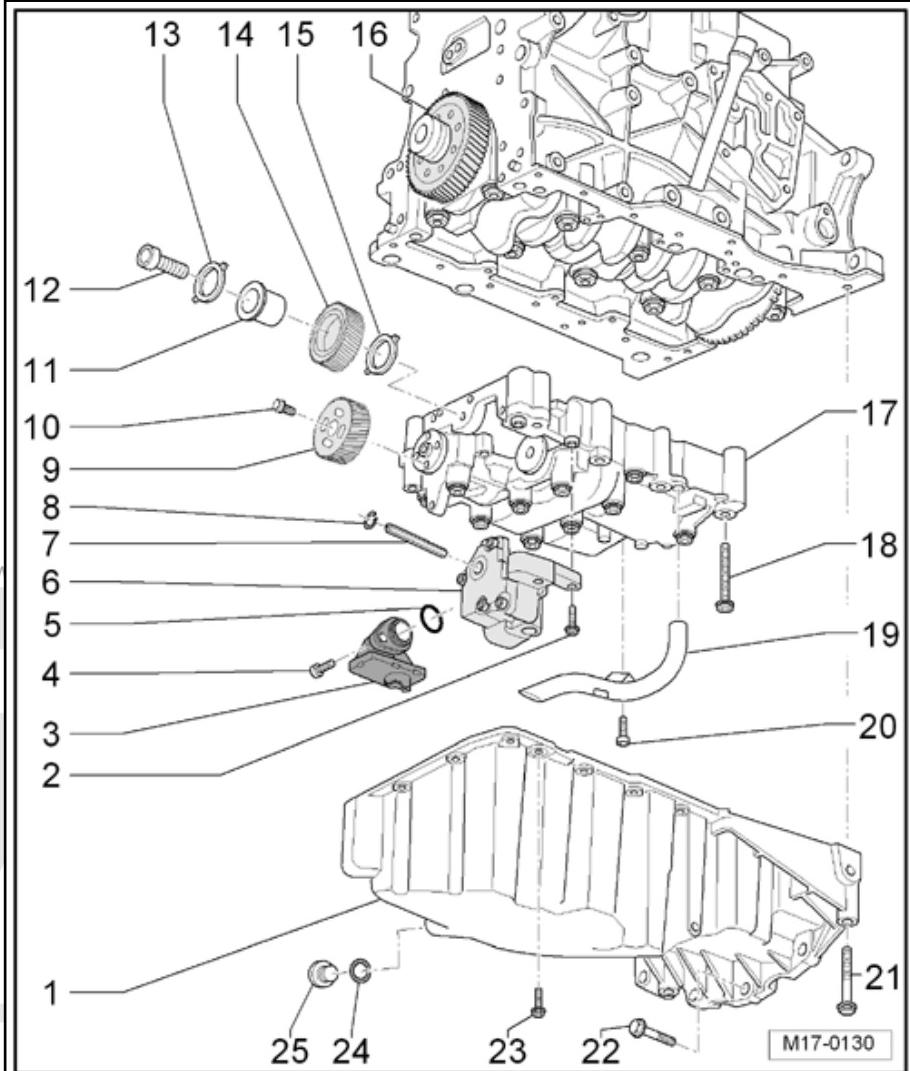
- Always replace
- 90 Nm + 90° (1/4 turn) additional turn

## 13 - Axial Bearing Disc

- Always replace
- For the intermediate sprocket
- Note the installation position Refer to [Fig. “Axial Bearing Disc Installation Position”, page 143](#).

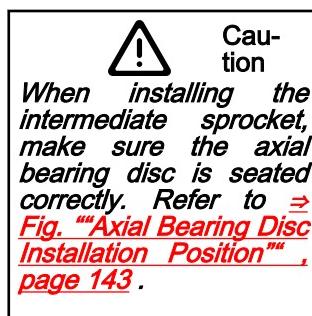
## 14 - Intermediate Sprocket

- Always replace
- To achieve the correct backlash, a coating is applied to the intermediate sprocket. The correct play adjustment is made through the wear.
- For the correct installation position, a white dot is applied on the intermediate sprockets with coating on parts of the circumference





- If there is no white dot, the entire circumference of the intermediate sprocket is coated.



- Installation position: the part number must be visible
- Removing and installing. Refer to ["2.4 Balance Shaft Assembly, Removing and Installing", page 146](#); Balance Shaft Assembly, Removing and Installing

## 15 - Axial Bearing Disc

- Always replace
- For the intermediate sprocket
- Note the installation position Refer to [Fig. "Axial Bearing Disc Installation Position"](#), page 143
- If necessary, secure to the housing with lubricant to install the intermediate sprocket

## 16 - Crankshaft Spur Gear

- Spur Gear, Removing from Crankshaft and Shrink-Fitting a New Spur Gear. Refer to ["2.5 Spur Gear, Removing from Crankshaft and Shrink-Fitting New Spur Gear", page 153](#).

## 17 - Balance Shaft Assembly

- Removing and installing. Refer to ["2.4 Balance Shaft Assembly, Removing and Installing", page 146](#).
- Before installing, check if both alignment sleeves for centering the balance shaft assembly on the cylinder block are present.

## 18 - Bolt

M7 bolt:

- 13 Nm + 90° (1/4) additional turn
- M8 bolt:
- 20 Nm + 90° (1/4) additional turn
- Always replace
- Note the tightening sequence. Refer to ["2.4 Balance Shaft Assembly, Removing and Installing", page 146](#), Balance Shaft Assembly, Removing and Installing

## 19 - Oil Intake Pipe

## 20 - Bolt

- 10 Nm

## 21 - Bolt

- 40 Nm

## 22 - Bolt

- 45 Nm

## 23 - Bolt

- 15 Nm
- Tighten diagonally in steps

## 24 - Seal

- Always replace

## 25 - Oil Drain Plug



30 Nm

### Oil Spray Jet and Pressure Relief Valve

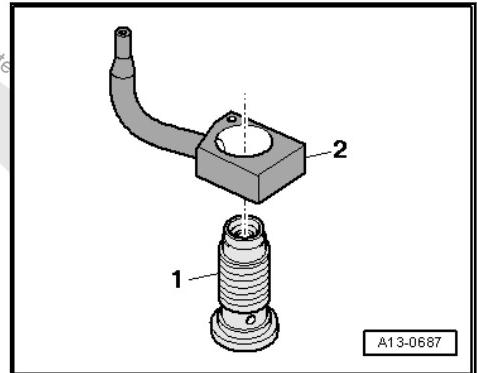
- 1 - Bolt with Pressure Relief Valve, 27 Nm (Insert Without Sealant)
- 2 - Piston Cooling Oil Spray Jet



#### Note

*When replacing the oil injector jet, pay attention to the correct allocation for the pistons. Refer to Parts Catalog*

"Pay attention to the warnings". Refer to [⇒ page 140](#).



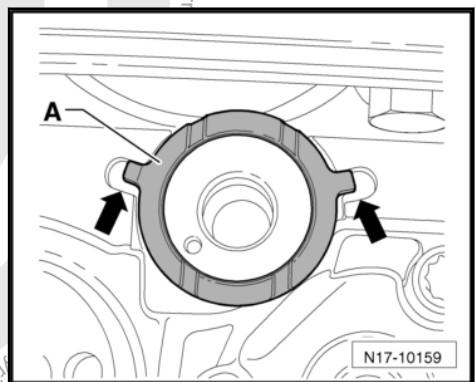
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### Axial Bearing Disc Installation Position



#### Caution

*Make sure the axial bearing disc -A- does not slip out of the recesses on the balance shaft housing during installation -arrows- which would cause it to get stuck. If necessary, secure with grease on the balance shaft assembly.*



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## 2.2 Oil Pan, Removing and Installing

### Special tools and workshop equipment required

- ◆ T Bar And Socket - 10mm - 3185-
- ◆ Hex Ball Socket - T10058-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Used Oil Collection and Extraction Unit - SMN372500-
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear
- ◆ Flat-Blade Scraper
- ◆ Silicone Sealant - D 176 404 A2-

### Removing:

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
- Drain the engine oil. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions .



#### Note

*Follow all waste disposal regulations!*

- Install the insulation on the oil pan.
- Remove the bolts connecting the oil pan and transmission.
- Remove the oil pan.



- Tap the oil pan lightly with a rubber hammer to loosen it, if necessary.
- Remove the sealant residue from cylinder block with a flat-blade scraper.



### WARNING

*Wear protective eyewear.*

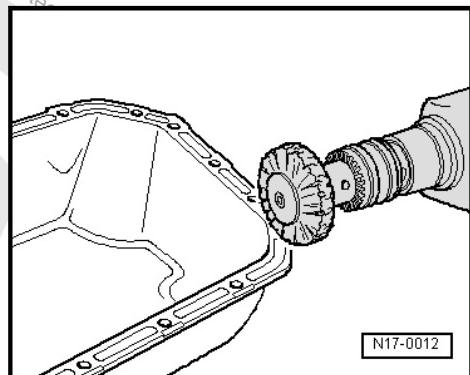
- Remove the sealant residue on the oil pan using a rotating brush such as a hand drill with a plastic brush attachment.
- Clean the sealing surfaces. They must be free of oil and grease.

### Installing:



#### Note

- ◆ Note the expiration date for the Sealant .
- ◆ The oil pan must be installed within five minutes after applying the Silicone Sealant .

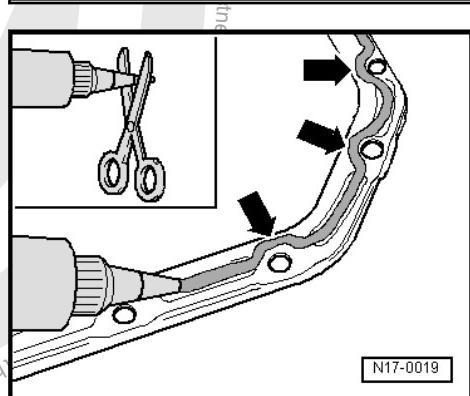


- Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).



#### Note

The sealant bead must not be thicker than 2 to 3 mm, or else excess sealant could get into oil pan and block the screen in the oil pump intake tube.



- Apply the Silicone Sealant as shown on the clean oil pan sealing surface. The sealing compound bead must be:
  - 2 to 3 mm thick
  - run around inside of bolt holes -arrows-

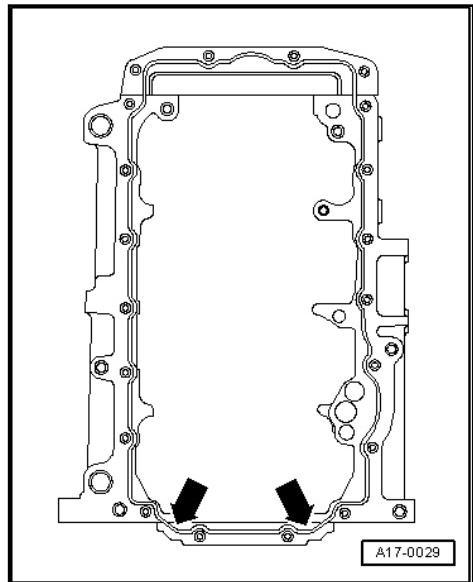


- Apply Silicone Sealant to the clean oil pan sealing surface as shown. (The illustration shows the location of the sealant bead on the cylinder block.)
- Position the oil pan immediately and gently tighten the bolts connecting the oil pan to the transmission and all of the oil pan bolts. Make sure the oil pan lies flush on the intermediate plate/transmission flange.

**Note**

*When installing the oil pan on a removed engine, make sure that the oil pan is positioned flush with the cylinder block on the flywheel side.*

- Tighten the oil pan bolts in a diagonal sequence.
- Tightening specification -Item 23- [⇒ Item 23 \(page 142\)](#) .
- Tighten the oil pan/cylinder block bolts.
- Tightening specification -Item 21- [⇒ Item 21 \(page 142\)](#) .
- Tighten the oil pan/transmission bolts.
- Tightening specification -Item 22- [⇒ Item 22 \(page 142\)](#) .



**Note**

*After installing the oil pan, allow the Sealant to dry for approximately 30 minutes. Only afterward may the engine oil be replenished.*

Further installation is the reverse order of removal.

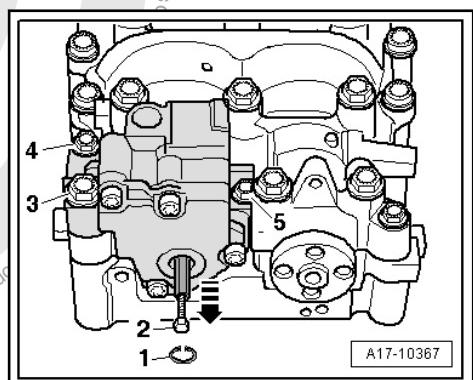
## 2.3 Oil Pump, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-

#### Removing:

- Remove the oil pan. Refer to [⇒ “2.2 Oil Pan, Removing and Installing”, page 143](#) .
- Remove the circlip 1- with locking ring pliers.
- If there is a thread in the drive shaft, install an M3 bolt 2- and remove the input shaft from the oil pump in direction of -arrow-.





**Note**

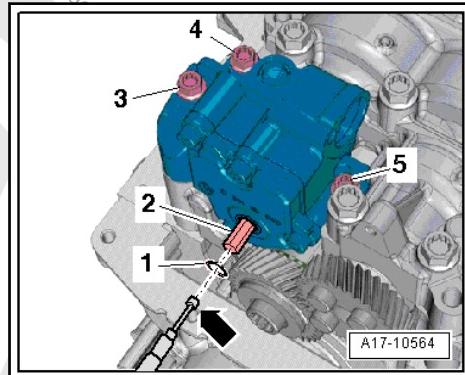
If there is no thread in the drive shaft, use a magnet -arrow- and pull the drive shaft out of the oil pump.

- Remove bolts -3, 4 and 5- and oil pump.



**Caution**

*Do not loosen the bolt on the intermediate sprocket.*



**Installing:**

Install in reverse order of removal. Note the following:

- Replace the O-ring.
- Replace damaged or stretched circlips.
- The circlip must lie in the base of the groove.
- Tightening specifications. Refer to [“2.1 Overview – Oil Pump, Oil Pan and Balance Shaft Assembly”, page 140](#), Overview - Oil Pump, Oil Pan and Balance Shaft Assembly
- Check that the alignment sleeves to center the oil pump on the balance shaft assembly are present before installing the oil pump.
- Install the oil pan. Refer to [“2.2 Oil Pan, Removing and Installing”, page 143](#).

## 2.4 Balance Shaft Assembly, Removing and Installing

[⇒ “2.4.1 Balance Shaft Assembly, Removing”, page 146](#).

[⇒ “2.4.2 New Balance Shaft Assembly, Installing”, page 148](#)

[⇒ “2.4.3 Used Balance Shaft Assembly, Installing”, page 152](#)

### 2.4.1 Balance Shaft Assembly, Removing

#### Special tools and workshop equipment required

- ◆ Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- for engines with a round crankshaft toothed belt sprocket
- ◆ Locking Tool - T10255-
- Remove the ribbed belt. Refer to [“1.3 Ribbed Belt, Removing and Installing”, page 42](#).
- Remove the belt pulley/vibration damper -Item 29- [⇒ Item 29 \(page 83\)](#).
- Remove the toothed belt guard lower section -Item 25- [⇒ Item 25 \(page 83\)](#).
- Remove the oil pan. Refer to [“2.2 Oil Pan, Removing and Installing”, page 143](#).

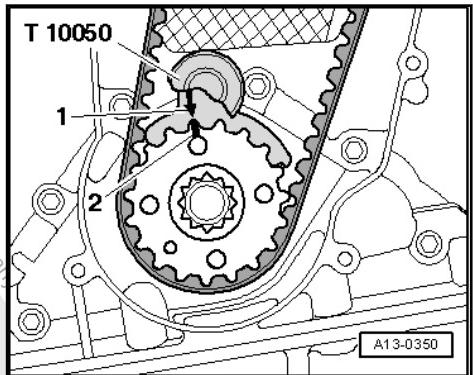


- Rotate the engine to TDC and secure the crankshaft toothed belt sprocket with the -T10050-. Push the crankshaft stop from the front side of the toothed belt sprocket into the splines. The camshaft toothed segment must be in the »12 o'clock« position.



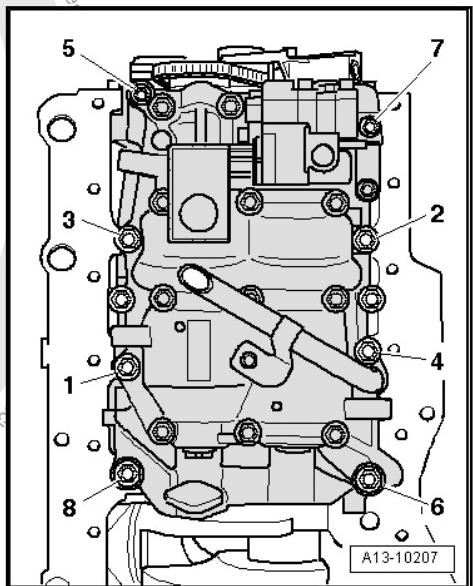
### Note

*The markings on the crankshaft toothed belt sprocket -2- and the -T10050- -1- must align. The pin on the -T10050- must engage in the hole on the sealing flange.*



- Remove the bolts in the sequence -8 to 1- and remove the balance shaft assembly with the oil pump.

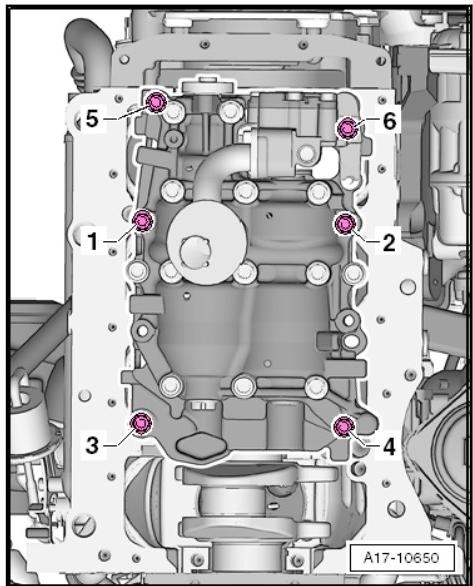
### Loosening Sequence - Balance Shaft Module with Six Attachment Points



- Remove the bolts in the sequence -6 through 1- and remove the balance shaft module with the oil pump.

**Refer to ⇒ “2.4.2 New Balance Shaft Assembly, Installing”,  
page 148**

**Refer to ⇒ “2.4.3 Used Balance Shaft Assembly, Installing”,  
page 152**





## 2.4.2 New Balance Shaft Assembly, Installing

### Conditions

- Crankshaft secured using the -T10100- or the -T10050- .

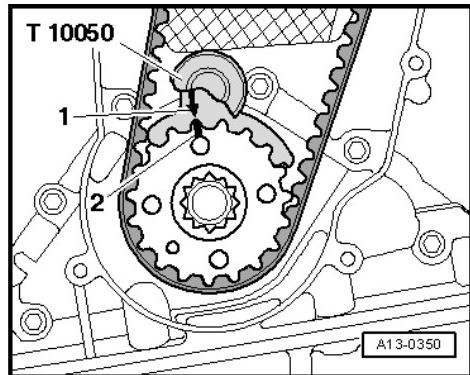


### Note

- The balance shaft assembly spur gear drive must be installed with the correct backlash.
- A coating is applied to the new intermediate sprocket to achieve the correct backlash.
- When the intermediate sprocket has a white dot, only sections of the circumference are coated. When there is not a white dot, then the entire circumference of the intermediate sprocket is coated.

The coating wears off in a short period of time and this ensures the correct backlash.

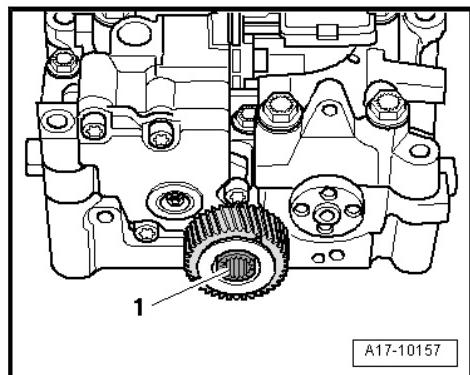
- For this reason, a new balance shaft assembly must always be installed in conjunction with a new intermediate sprocket with coating.
- Only intermediate sprockets with a partial coating have a white dot to indicate the correct installation position.
- No installation position must be observed for intermediate sprockets with coating on the entire circumference.
- Replace the bolts which have been tightened to torque.



### Caution

- The intermediate sprocket threaded connection must be loosened to position the balance shaft assembly. When doing so, make sure the bolt is not loosened too much. Otherwise the bearing disc could slip behind the intermediate sprocket.
- Axial bearing disc installation position. Refer to **Fig. "Axial Bearing Disc Installation Position"**, page 143 .

- Loosen the bolt -1- for the intermediate sprocket approximately 45° (1/8 turn) before mounting the balance shaft assembly on the cylinder block.
- Check that the alignment sleeves for centering the balance shaft assembly on the cylinder block are present.



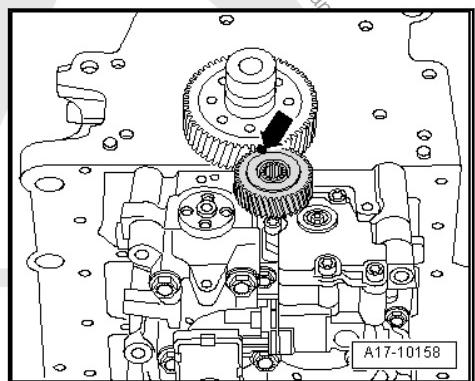


- Place the balance shaft assembly on the cylinder block and make sure the partially-coated intermediate sprocket is in the correct position:
- The white dot -arrow- on the intermediate sprocket must be centered to the crankshaft.



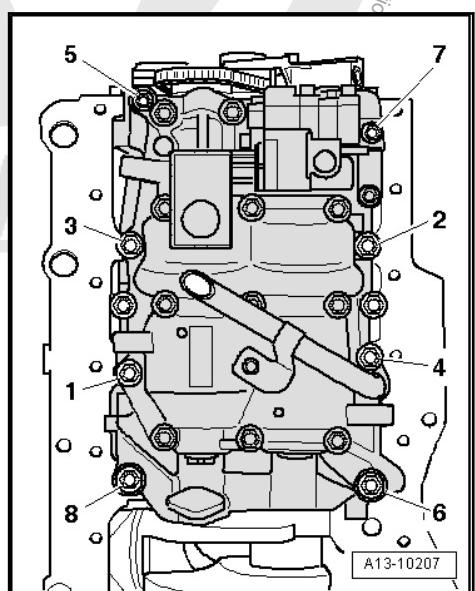
**Note**

- ◆ Make sure the coating on the intermediate sprocket is not damaged.
- ◆ Due to the gear ratio, the white dot -arrow- does not go back to its original position after the engine is turned over.

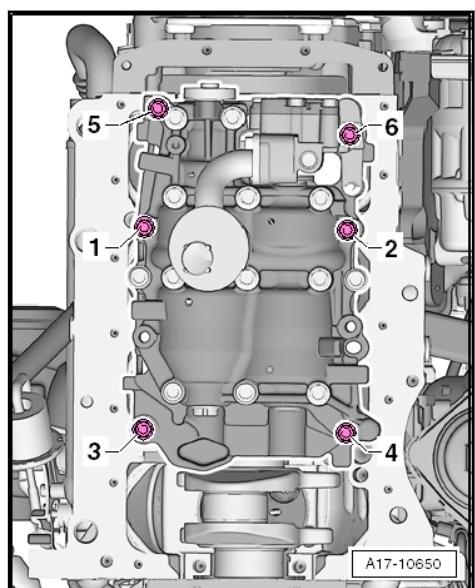


- Also install the new bolts in the sequence -1 to 8- hand-tight.
- Tighten the balance shaft assembly bolts as follows:
  1. Pretighten the bolts in sequence -1 to 8- to 6 Nm.
  2. Tighten the bolts -5 and 7- to 13 Nm.
  3. Turn the bolts -5 and 7- an additional 90° ( $\frac{1}{4}$  turn) using a rigid wrench.
  4. Tighten the bolts -1 to 4, 6 and 8- to 20 Nm.
  5. Turn the bolts -1 to 4, 6 and 8- an additional 90° ( $\frac{1}{4}$  additional turn) using a rigid wrench.
- Secure the balance shaft with the - T10255- . Rotate the balance shaft if necessary.

**Tightening Sequence - Balance Shaft Module with Six Attachment Points**

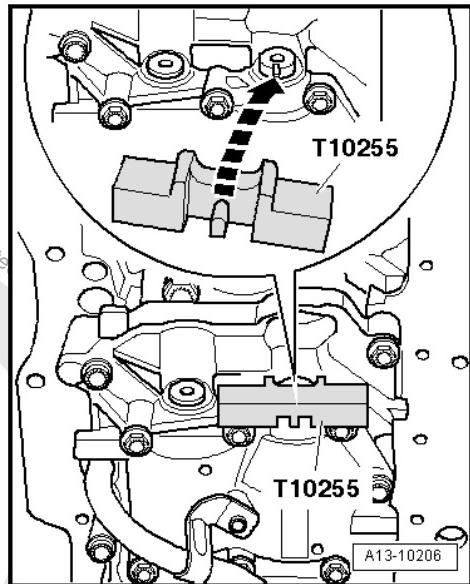


- Install the new bolts in the sequence -1 through 6- and tighten them by hand.
- Tighten the balance shaft module bolts in four stages as follows:
  1. Tighten the bolts -1 through 6- to 6 Nm.
  2. Tighten the bolts -1 through 4- to 20 Nm.
  3. Tighten the bolts in sequence -5 and 6- to 13 Nm.





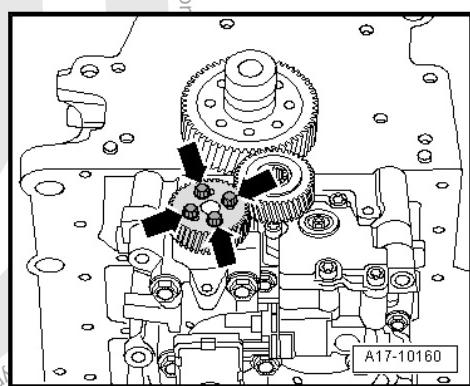
- 4. Tighten the bolts in sequence -1 through 6- turn an additional  $90^\circ$  ( $1/4$ ) turn using a ratchet.
- The locking tool pins must engage in the groove on the balance shaft.



- Carefully position the balance shaft spur gear on the balance shaft while pressing the intermediate sprocket to the side slightly.

**Note**

- ◆ Make sure the threaded holes on the balance shaft are centered as much as possible in the oblong holes on the balance shaft spur gear.
- ◆ If the oblong holes in the balance shaft spur gear cannot be aligned with the threaded holes in the cover, rotate the balance shaft spur gear the corresponding number of teeth and position it again.

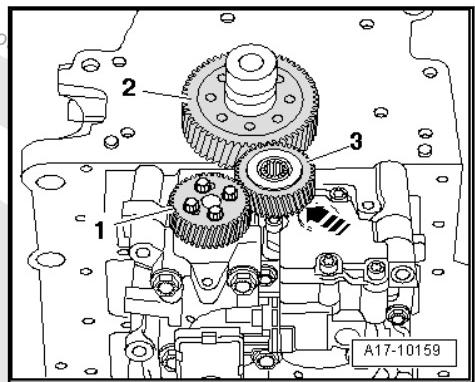


- Tighten the bolts for the balance shaft spur gear -arrows-.
- Remove the - T10255- .



The following three steps must be performed at the same time (a second technician is required):

- Press the intermediate gear -3- forcefully in the direction of -arrow- into the splines of the crankshaft spur gear -2- and the balance shaft spur gear -1- using a wooden block if necessary.
- Rotate the balance shaft spur gear counter-clockwise slightly.
- Tighten the new intermediate sprocket bolt:
  - Tightening specification -Item 12- [⇒ Item 12 \(page 141\)](#).
- Remove the -T10100- or the -T10050- .



#### Note

*The intermediate sprocket must not have any backlash after installation. This can be checked by pressing slightly by hand.*

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

- Install the oil pan. Refer to [“2.2 Oil Pan, Removing and Installing”, page 143](#).
- Install the toothed belt guard lower section:
  - Tightening specification -Item 27- [⇒ Item 27 \(page 83\)](#).
- Install the belt pulley/vibration damper.
- Tightening specification -Item 28- [⇒ Item 28 \(page 83\)](#).
- Install the ribbed belt. Refer to [“1.3 Ribbed Belt, Removing and Installing”, page 42](#).



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## 2.4.3 Used Balance Shaft Assembly, Installing

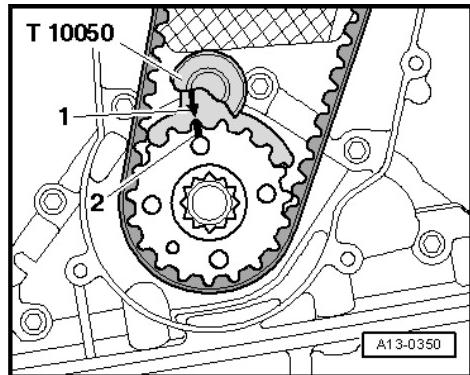
### Conditions

- Crankshaft secured using the -T10100- or the -T10050- .



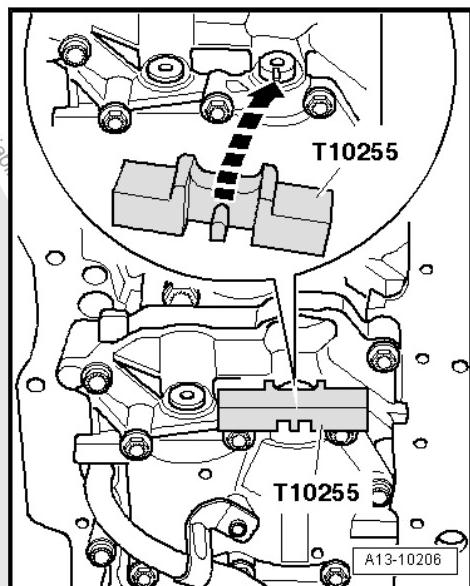
### Caution

- If the intermediate sprocket bolt was loosened, the crankshaft spur gear was replaced, or the crankshaft was removed, then a new intermediate sprocket with coating must be installed and the hub -Item 11-  $\Rightarrow$  Item 11 (page 141) including the bolt -Item 12-  $\Rightarrow$  Item 12 (page 141) and axial bearing disc -Item 13-  $\Rightarrow$  Item 13 (page 141) must be replaced. Otherwise the backlash will not be correct.
- Installation procedure. Refer to  $\Rightarrow$  "2.4.2 New Balance Shaft Assembly, Installing", page 148 , New Balance Shaft Assembly, Installing



### Note

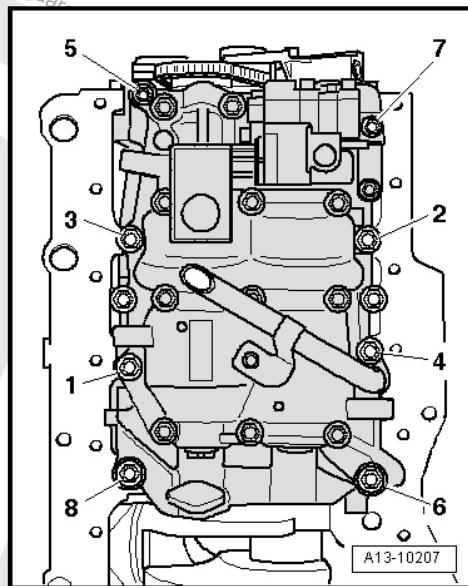
- Proceed as follows if the used balance shaft assembly will be installed again and neither the crankshaft spur gear was replaced nor the crankshaft was removed. Never loosen the intermediate sprocket.
- Replace the bolts which have been tightened to torque.
- Secure the balance shaft with the - T10255- . Rotate the balance shaft if necessary.
- The locking tool pins must engage in the groove on the balance shaft.
- Check that the alignment sleeves for centering the balance shaft assembly on the cylinder block are present.
- Position the balance shaft assembly on the cylinder block. The intermediate sprocket must engage in the spur gear on the crankshaft when the balance shaft is locked.
- The intermediate sprocket must have slight noticeable backlash.





- Also install the new bolts in the sequence -1 to 8- hand-tight.
- Tighten the balance shaft assembly bolts as follows:
  1. Pretighten the bolts in sequence -1 to 8- to 6 Nm.
  2. Tighten the bolts -5 and 7- to 13 Nm.
  3. Turn the bolts -5 and 7- an additional 90° (1/4 turn) using a rigid wrench.
  4. Tighten the bolts -1 to 4, 6 and 8- to 20 Nm.
  5. Turn the bolts -1 to 4, 6 and 8- an additional 90° (1/4 additional turn) using a rigid wrench.

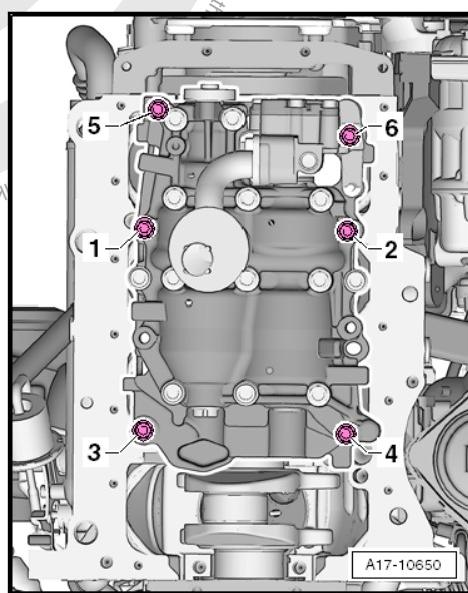
#### Tightening Sequence - Balance Shaft Module with Six Attachment Points



- Install the new bolts in sequence -1 through 6- and tighten them by hand.
- Tighten the balance shaft module bolts in four stages as follows:
  1. Tight the bolts -1 through 6- to 6 Nm.
  2. Tighten the bolts -1 through 4- to 20 Nm.
  3. Tighten the bolts in sequence -5 and 6- to 13 Nm.
  4. Tighten the bolts in sequence -1 through 6- turn an additional 90° (1/4) turn using a ratchet.
- Remove the -T10100- or the -T10050- .

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

- Install the oil pan. Refer to [“2.2 Oil Pan, Removing and Installing”, page 143](#) .
- Install the toothed belt guard lower section:
  - Tightening specification -Item 27- [⇒ Item 27 \(page 83\)](#) .
- Install the belt pulley/vibration damper.
  - Tightening specification -Item 28- [⇒ Item 28 \(page 83\)](#) .
- Install the ribbed belt. Refer to [“1.3 Ribbed Belt, Removing and Installing”, page 42](#) .



## 2.5 Spur Gear, Removing from Crankshaft and Shrink-Fitting New Spur Gear

[⇒ “2.5.1 Spur Gear, Removing from Crankshaft”, page 153](#) .

[⇒ “2.5.2 New Spur Gear, Shrink-Fitting”, page 155](#) .

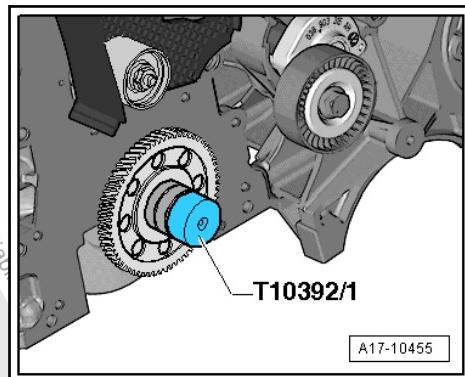
### 2.5.1 Spur Gear, Removing from Crankshaft

#### Special tools and workshop equipment required

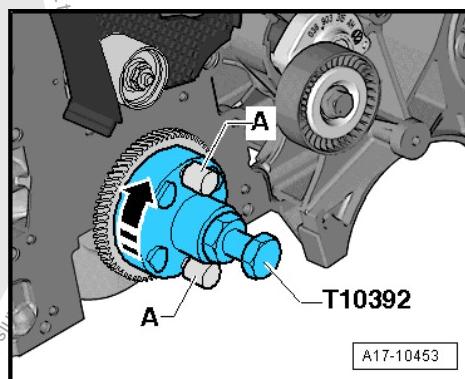
- ◆ Seal Installer - Crankshaft/Camshaft - 10-203-
- ◆ Commercially available hotplate
- ◆ Puller - Spur Gear - T10392- with



- ◆ Puller - Spur Gear - Press Piece - T10392/1-
- ◆ Digital Thermometer - VAS6519-
- ◆ Safety Gloves
- Remove the belt pulley side sealing flange. Refer to [“2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 60](#).
- Remove the balance shaft assembly. Refer to [“2.4 Balance Shaft Assembly, Removing and Installing”, page 146](#).
- Insert the -T10392/1- into the crankshaft journal.

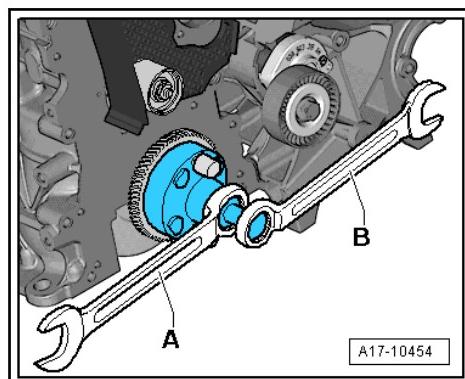


A17-10455



A17-10453

Insert the - T10392- into the holes in the spur gear and turn it clockwise in direction of -arrow-, then install the locating pin -A-.



A17-10454

- Counterhold the crankshaft with a wrench -A-. Remove the spur gear by installing the spindle with the wrench -B- or ratchet.



## 2.5.2 New Spur Gear, Shrink-Fitting



### Note

- ◆ Check the temperature with the -VAS6519- when heating up the new spur gear.
- ◆ When the temperature reaches 200 °C (392 °F), there are about four seconds to position the spur gear on the crank-shaft.
- ◆ A higher temperature increases the amount of time available for positioning (220 °C (428 °F) = approximately six seconds).
- ◆ Make sure the crankshaft journal is clean.



### Caution

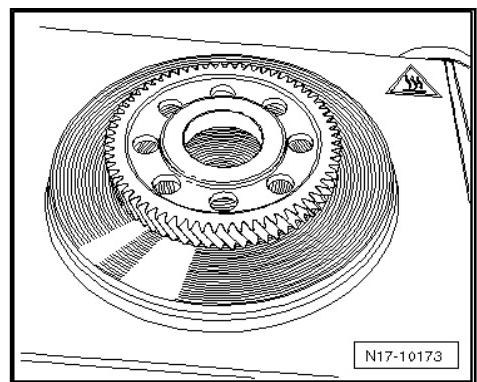
**Do not exceed the maximum temperature of 240 °C (464 °F). Otherwise the spur gear will discolor and possibly become distorted.**

- Lay the entire surface of the new spur gear on a commercially available hot plate and heat it to at least 200 °C (392 °F), maximum 240 °C (464 °F). The lettering faces upward.



### WARNING

**There is a risk of burns. Wear suitable safety gloves during the rest of the procedure.**

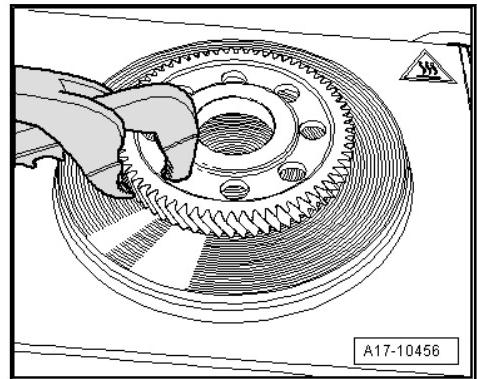


- After the temperature is reached, remove the spur gear from the pliers as shown.



### Note

**Make sure the splines on the spur gear are not damaged.**

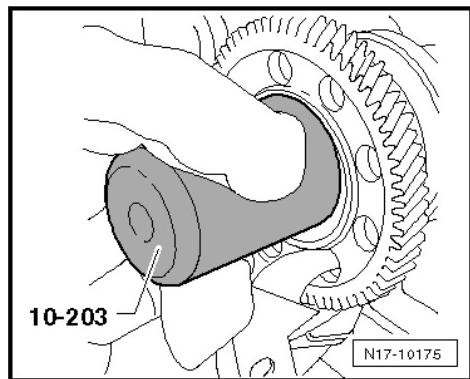




- Quickly slide the spur gear by onto the crankshaft journal all the way by hand. Use the - 10-203- for assistance and do not tilt the gear.
- Let the spur gear cool a few minutes.

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

- Install the balance shaft assembly. Refer to [“2.4 Balance Shaft Assembly, Removing and Installing”, page 146](#).
- Install the belt pulley side sealing flange. Refer to [“2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 60](#).





### 3 Lubrication System Components, Engine Code CJAA

- ⇒ “3.1 Overview - Oil Pump and Oil Pan”, page 157
- ⇒ “3.2 Oil Pan, Removing and Installing”, page 159
- ⇒ “3.3 Oil Pump, Removing and Installing”, page 162



#### Caution

If large quantities of metal shavings or abraded material are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent subsequent damage, perform the following steps after the repair:

- ◆ Clean the oil channels carefully
- ◆ Replace the oil spray jets
- ◆ Replace the oil cooler
- ◆ Replace the oil filter.

#### 3.1 Overview - Oil Pump and Oil Pan

“Pay attention to the warnings”. Refer to ⇒ [page 157](#).

Oil spray nozzle and pressure relief valve. Refer to ⇒ [Fig. “Oil Spray Jet and Pressure Relief Valve”](#), page 159.





**1 - Bolt**

- 15 Nm

**2 - Sealing Flange**

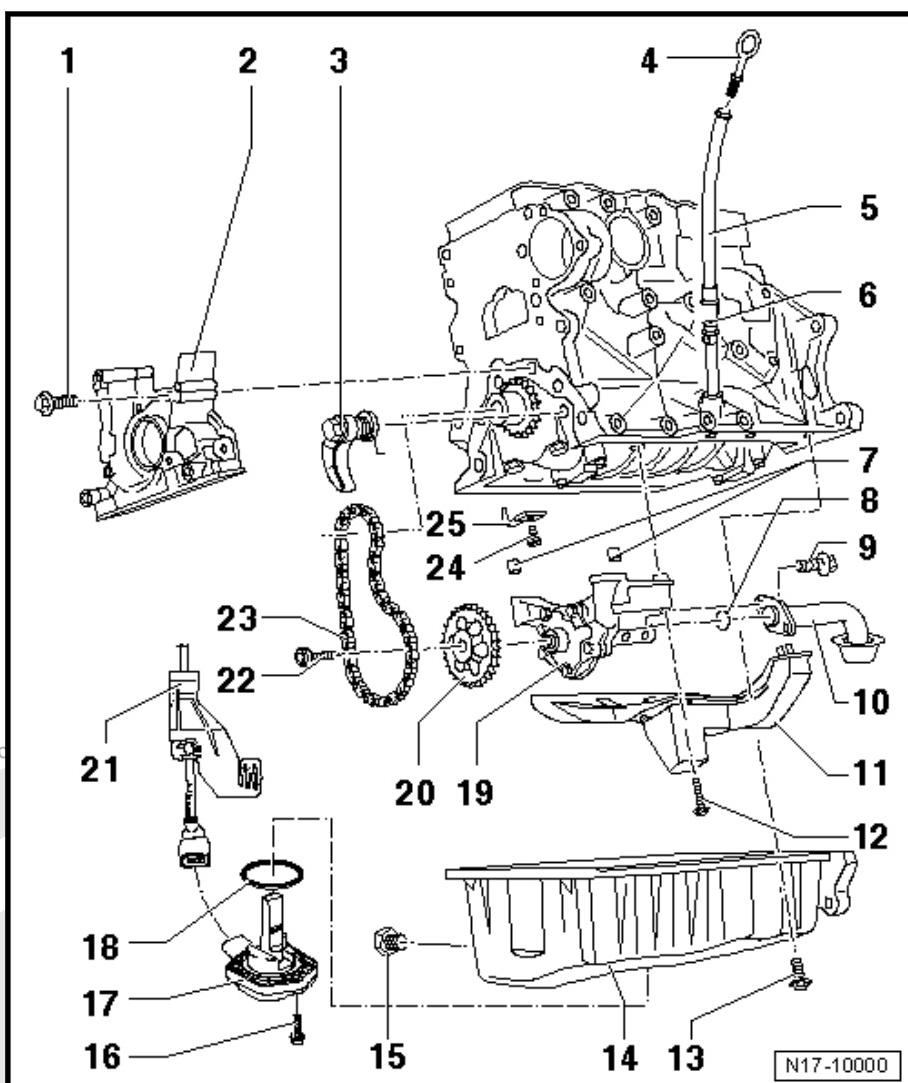
- With gasket
- Must rest on the alignment sleeves
- Removing and installing. Refer to ["2.4 Sealing Flange, Removing and Installing, Belt Pulley Side"](#), page 60 .
- Insert with Silicone Sealant - D 176 404 A2 .
- Do not coat the sealing lip on the seal with oil or grease
- Before installing, remove oil residue from crankshaft journal with a clean cloth.

**3 - Chain Tensioner with Tensioning Rail**

- 15 Nm
- When installing, pre-tension the spring and engage it

**4 - Oil Dipstick**

- Oil level must not be above the MAX. mark!
- Marks. Refer to ["1.3 Engine Oil, Checking Level"](#), page 138 .



**5 - Funnel**

**6 - Guide Tube**

**7 - Alignment Sleeves**

**8 - O-Ring**

- Always replace

**9 - Bolt**

- 15 Nm

**10 - Suction Line**

- Clean the screen if there are debris

**11 - Splash Wall**

**12 - Bolt**

- 15 Nm

**13 - Bolt**

- 15 Nm

**14 - Oil Pan**

- Removing and installing. Refer to ["3.2 Oil Pan, Removing and Installing"](#), page 159 .
- Clean sealing surface before installing
- Install with silicone sealant D 176 404 A2



### 15 - Oil Drain Plug

- 30 Nm
- Always replace

### 16 - Bolt

- 10 Nm

### 17 - Oil Level Thermal Sensor - G266-

- Black 3-pin connector
- Checking. Refer to Vehicle Diagnostic Tester .

### 18 - Seal

- Always replace

### 19 - Oil Pump

- With pressure relief valve 12 bar (174.04 psi)
- Replace if it moves with difficulty
- Check if the oil pump moves with difficulty
- Before installing, check to be sure both alignment sleeves are present (for centering oil pump/cylinder block)
- Removing and installing. Refer to ["3.3 Oil Pump, Removing and Installing", page 162](#)

### 20 - Chain Sprocket for Oil Pump

### 21 - Bracket

- For the wiring harness Oil Level Thermal Sensor - G266-

### 22 - Bolt

- 20 Nm + 1/4 (90 °) additional turn

### 23 - Chain

### 24 - Bolt

- 25 Nm
- Install without sealant

### 25 - Oil Spray Jet

- For the piston cooling. Refer to [Fig. "Oil Spray Jet and Pressure Relief Valve", page 159](#) .

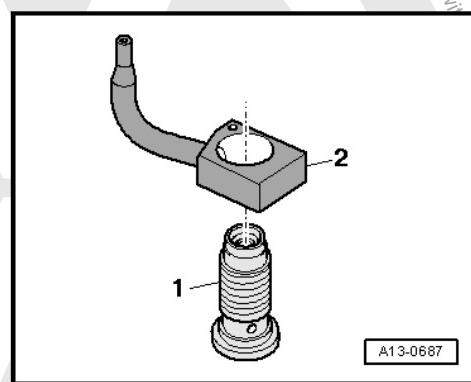
### Oil Spray Jet and Pressure Relief Valve

- 1 - Bolt with Pressure Relief Valve, 27 Nm
- 2 - Piston Cooling Oil Spray Jet



When replacing the oil injector jet, pay attention to the correct allocation for the pistons. Refer to Parts Catalog

"Pay attention to the warnings". Refer to [page 157](#) .



A13-0687

## 3.2 Oil Pan, Removing and Installing

### Special tools and workshop equipment required

- ◆ T Bar And Socket - 10mm - 3185-
- ◆ Hex Ball Socket - T10058-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Used Oil Collection and Extraction Unit - SMN372500-



- ◆ Silicone Sealant - D176404A2-
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear
- ◆ Flat-Blade Scraper

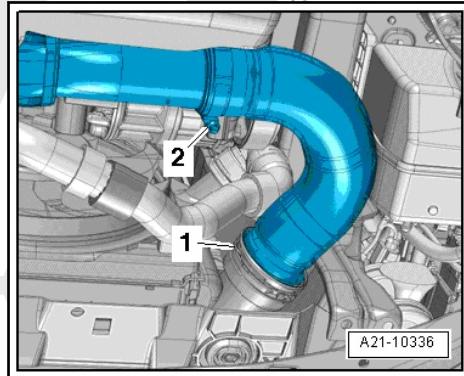
### Removing

- Remove the noise insulation. Refer to ⇒ Rep. Gr. 50 .
- Place the Used Oil Collection and Extraction Unit - SMN372500- under the engine and drain the engine oil.

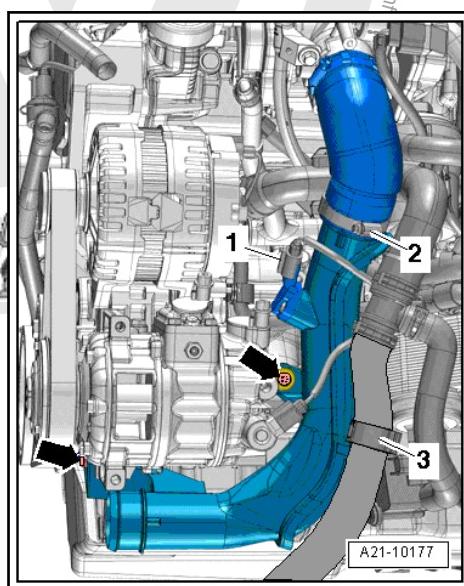


*Follow all waste disposal regulations!*

- Loosen the clamp -2-, lift the clip -1- and remove the connecting hose »cold side«.

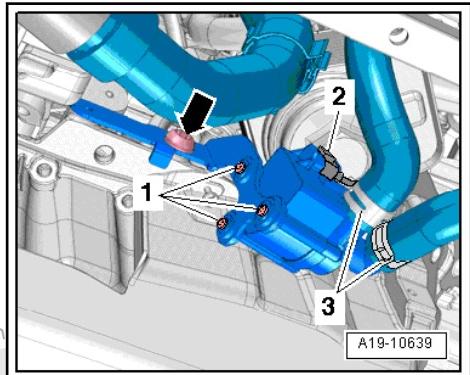


- Remove the bolts -arrows- on the charge air pipe and move it to the side.

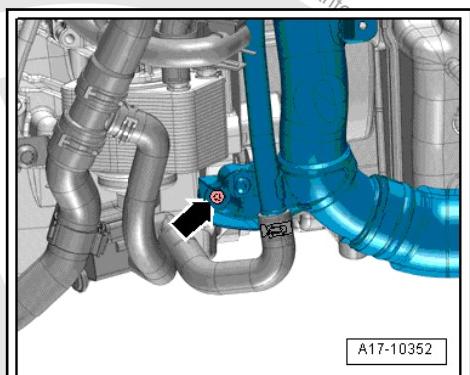




- Remove the bolt -arrow- and move the Engine Coolant Circulation Pump 2 - V178- to the side.



- Remove the bolt -arrow- on the charge air pipe on the »hot side«.
- Disconnect the connector from the Oil Level Thermal Sensor - G266- .
- Remove the bolts connecting the oil pan and transmission.
- Remove the oil pan screws in a diagonal sequence.
- Tap the oil pan lightly with a rubber hammer to loosen it, if necessary.
- Remove the sealant residue from the crankshaft housing with a flat-blade scraper.



### WARNING

*Wear protective eyewear.*

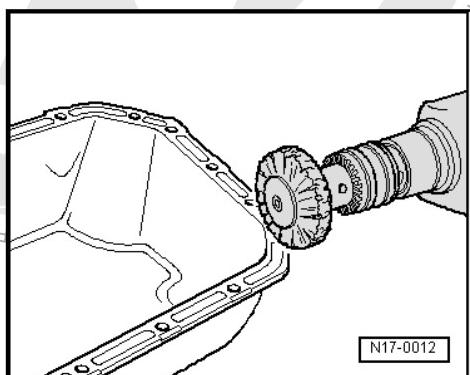
- Remove any sealant residue on the oil pan using a rotating brush, for example, a hand drill with a plastic brush attachment.
- Clean the sealing surfaces. They must be free of oil and grease.

### Installing



### Note

- ◆ Note the expiration date for the sealant.
- ◆ The oil pan must be installed within five minutes after applying the silicone sealant.

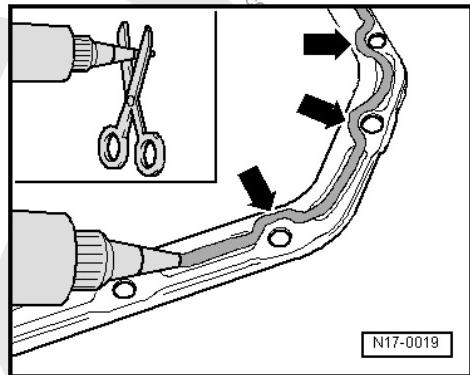




- Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).
- Apply the silicone sealant as shown on the clean oil pan sealing surface. The sealing compound bead must be:
  - ◆ 2 to 3 mm thick
  - ◆ and run on inside in the area of the bolt holes -arrows-

**Note**

*Sealant bead must not be thicker than specified. Otherwise, excess sealant could get into oil pan and clog the screen in intake line of oil pump.*



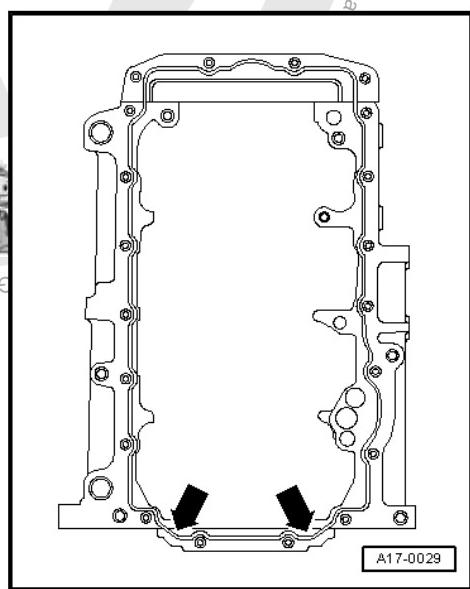
N17-0019

- Apply a silicone sealing compound bead as shown to the clean sealing surface of the oil pan. (The illustration shows the location of the sealant bead on the crankshaft housing.)
- Position the oil pan immediately and gently tighten the bolts connecting the oil pan to the transmission and all of the oil pan bolts. Make sure the oil pan lies flush on the intermediate plate/transmission flange.

**Note**

*When installing the oil pan on a removed engine, make sure that the oil pan is positioned flush with the crankshaft housing on the flywheel side.*

- Tighten the oil pan bolts in a diagonal sequence to 15 Nm.
- Tighten the oil pan/transmission bolts to 40 Nm.



A17-0029

**Note**

*After installing the oil pan, allow the sealant to dry for approximately 30 minutes. Only afterward may the engine oil be replenished.*

Further assembly is performed in the reverse order of the removal.

### 3.3 Oil Pump, Removing and Installing

#### Removing

- Remove the oil pan and the splash wall. Refer to [“3.2 Oil Pan, Removing and Installing”, page 159](#).



- Remove the bolt -2-.
- Pull off chain sprocket from oil pump shaft.
- Remove the bolts -1 and 3- and remove the oil pump.

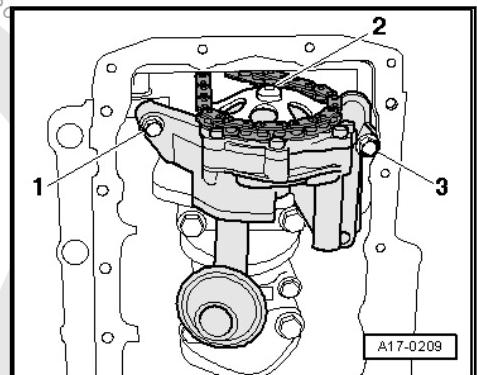
### Installing

Install in reverse order of removal. Note the following:

- Insert the alignment sleeves. Refer to -Item 7- [⇒ Item 7 \(page 158\)](#) at the top of the oil pump.

Insert the chain sprocket can only be positioned one way on the oil pump shaft (flat side).

- Install the oil pan. Refer to [⇒ “3.2 Oil Pan, Removing and Installing”, page 159](#).



### Tightening Specifications

Component	Nm
Chain sprocket to oil pump shaft	20 Nm + 90°. Refer to <sup>2)</sup> .
Oil pump to cylinder block	15

- 2) Replace the bolts.





## 4 Oil Filter Bracket, Oil Cooler, Oil Pressure and Oil Supply Line

- ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 164
- ⇒ “4.2 Oil Filter Bracket with Oil Cooler, Removing and Installing”, page 166
- ⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 169
- ⇒ “4.4 Oil Pressure and Oil Pressure Switch F1 , Checking”, page 171



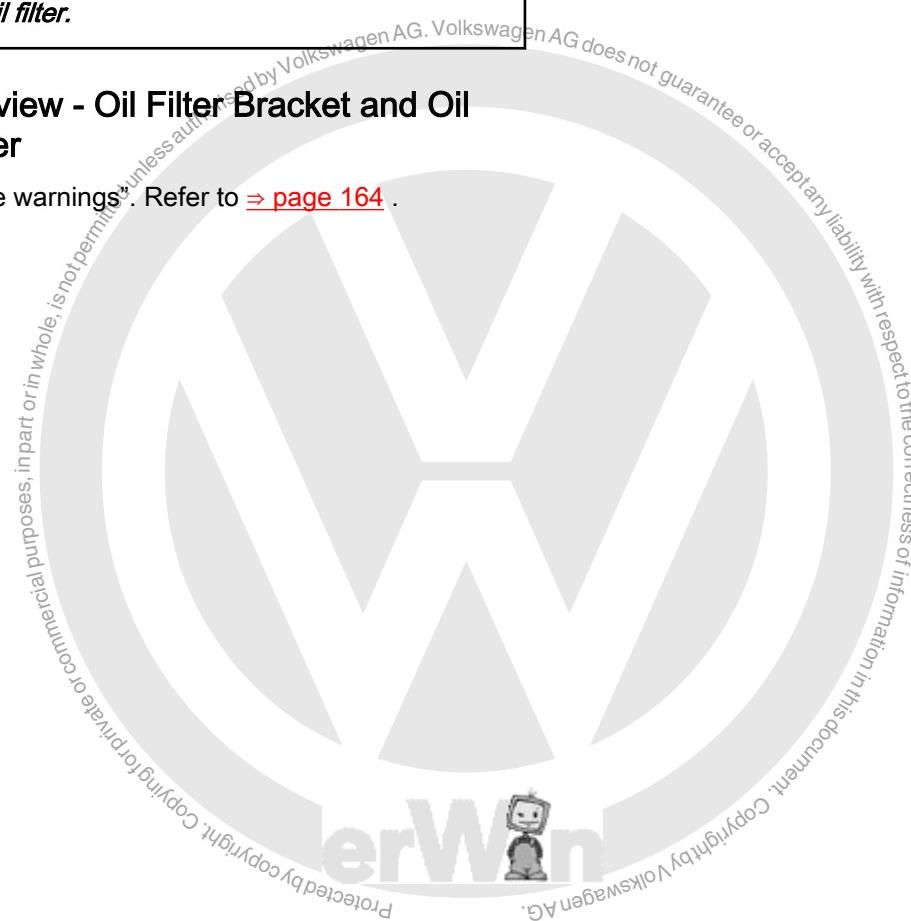
### Caution

*If large quantities of metal shavings or abraded material are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent subsequent damage, perform the following steps after the repair:*

- ◆ *Clean the oil channels carefully*
- ◆ *Replace the oil spray jets*
- ◆ *Replace the oil cooler*
- ◆ *Replace the oil filter.*

### 4.1 Overview - Oil Filter Bracket and Oil Cooler

“Pay attention to the warnings”. Refer to ⇒ [page 164](#).





### 1 - Seal

- Always replace

### 2 - Bolt

- 15 Nm + 1/4 (90 °) additional turn
- Always replace
- First, fasten upper left and lower right bolts, and then tighten all four bolts in a diagonal sequence

### 3 - Oil Filter Bracket

- Make sure there is enough space to the surrounding components

### 4 - Seal

- Always replace

### 5 - Connection

- 30 Nm

### 6 - Oil Supply Line

- 22 Nm
- Do not change the angles of the oil supply line
- Install without tension
- To turbocharger, engine codes CBEA and CJAA -Item 4- [⇒ Item 4 \(page 245\)](#)
- Removing and installing. Refer to [⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 169](#).
- Before installing, check the oil supply line for clear passage
- Fill with engine oil before installing the turbocharger oil supply line on the connections

### 7 - Oil Pressure Switch - F1-

- 22 Nm
- Identification: brown
- 0.7 bar (10.15 psi)
- If sealing ring is leaking cut open and replace.
- Oil Pressure and Oil Pressure Switch - F1- , Checking. Refer to [⇒ “4.4 Oil Pressure and Oil Pressure Switch F1 , Checking”, page 171](#) .

### 8 - Cover

- 25 Nm

### 9 - O-Ring

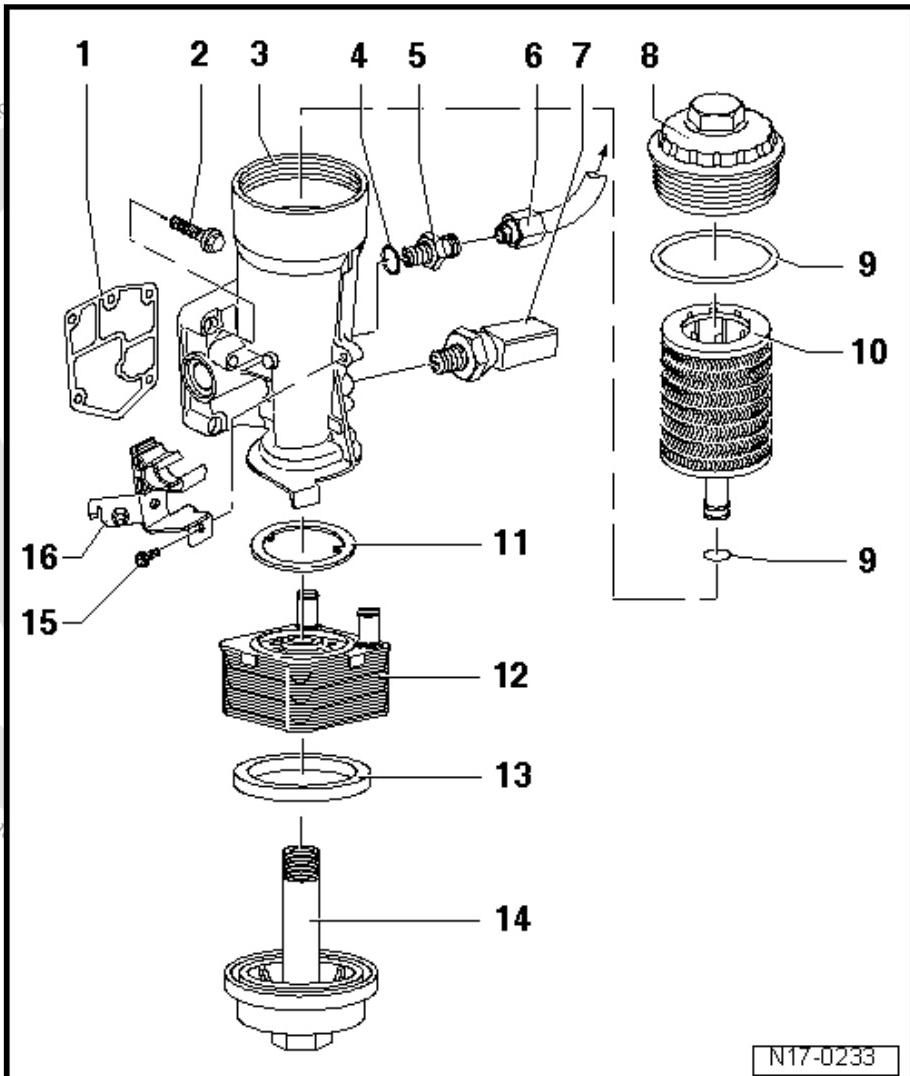
- Always replace

### 10 - Oil Filter Element

- “Pay attention to the warnings”. Refer to [⇒ page 164](#) .
- Follow the replacement intervals. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions .

### 11 - Seal

- Always replace



N17-0233



- Coat with oil before assembly
- snaps into the tabs of the oil cooler

## 12 - Oil Cooler

- "Pay attention to the warnings". Refer to [page 164](#).
- Make sure there is enough space to the surrounding components
- Coolant Hose Connection Diagram. Refer to ["1.4 Coolant Hose Connection Diagram", page 183](#).
- Oil Cooler, Checking for Leaks. Refer to ["1.12 Oil Cooler, Checking for Leaks", page 197](#).

## 13 - Seal

- Always replace

## 14 - Sealing Plug

- 25 Nm

## 15 - Bolt

- 10 Nm

## 16 - Bracket

- For wiring harness

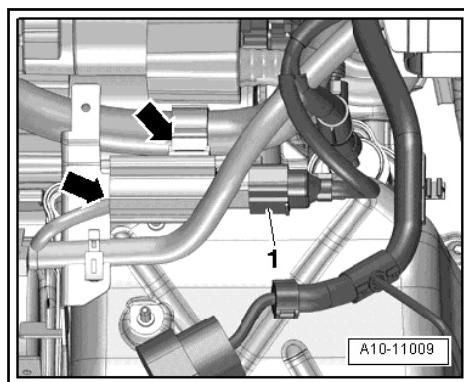
## 4.2 Oil Filter Bracket with Oil Cooler, Removing and Installing

### Special tools and workshop equipment required

- ◆ Elbow Assembly Tool - T10118-
- ◆ Drip tray for the oil

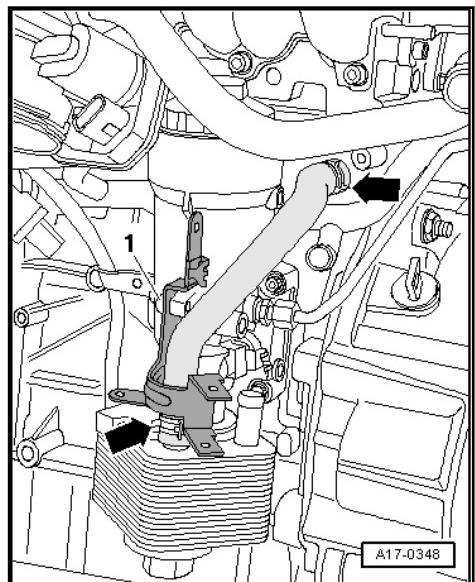
### Removing

- Drain the coolant. Refer to ["1.10 Coolant, Draining and Filling", page 192](#).
- Remove the air filter housing. Refer to ["3.15 Overview - Air Filter", page 311](#).
- Remove the air shroud. Refer to ["1.5 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177, Removing and Installing", page 188](#).
- Free up the wiring harnesses -arrows- and the connector -1- on the charge air pipe on the »hot side«.

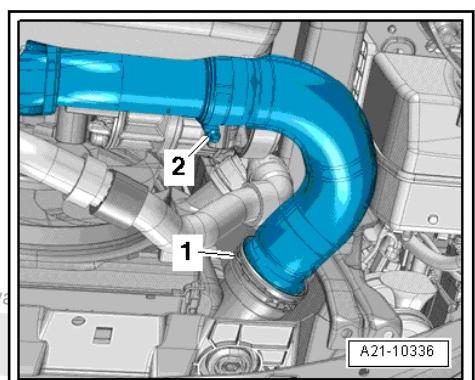




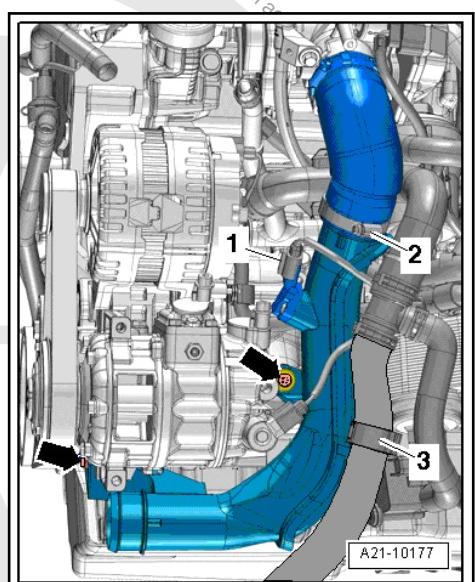
- Remove the bolt -1- and remove the bracket.
- Disconnect the coolant hoses from the oil cooler.



- Loosen the clamp -2-, lift the clip -1- and remove the hose »cold side« from the charge air cooler.
- Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .

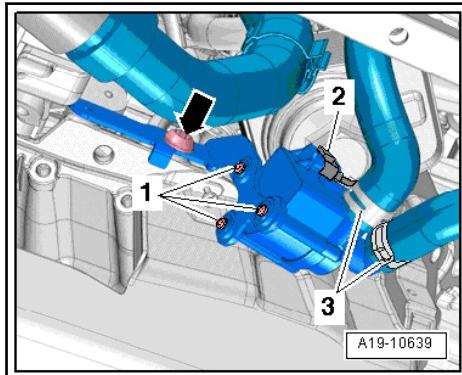


- Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.

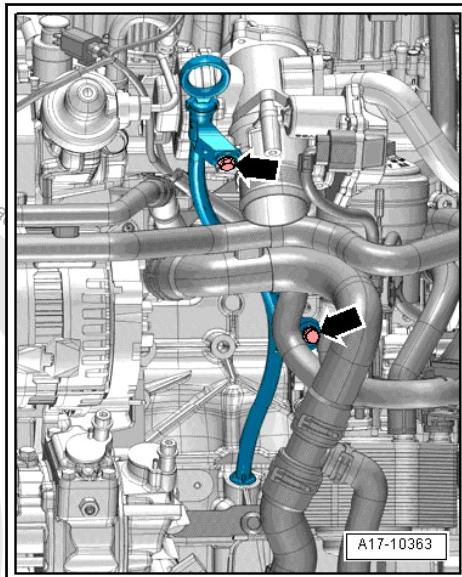




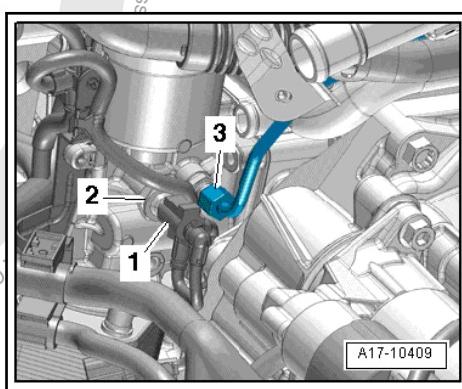
- Remove the bolt -arrow- and move the Engine Coolant Circulation Pump 2 - V178- to the side.



- Remove the bolts -arrows- on the oil dipstick tube.
- Remove the guide tube upward from the crankshaft housing and move it to the side.



- Disconnect the connector -1- on the Oil Pressure Switch - F1- using the -T10118- and remove the oil pressure switch.
- Remove the oil supply line -3- on the oil filter bracket. Counter-hold it if necessary with an open end wrench.
- Place the oil drip tray under the engine.



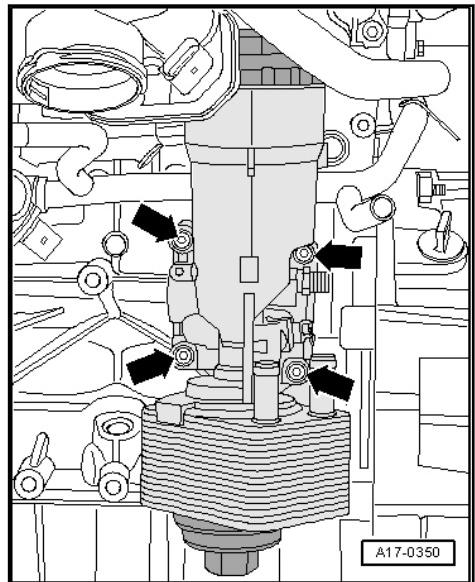


- Unscrew the bolts -arrows- and remove oil filter bracket.

### Installing

Install in reverse order of removal while noting the following:

- ◆ Replace all seals, gaskets and O-rings.
- ◆ Oil filter bracket tightening specification. Refer to [“4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 164](#).
- ◆ Charge air cooler tightening specifications. Refer to [“4.2 Overview - Charge Air Cooler Components”, page 265](#).
- ◆ Fill the coolant. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).



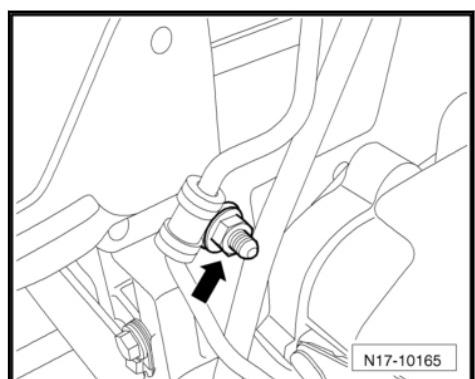
## 4.3 Oil Supply Line to Turbocharger, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Union Nut Socket - T40055-

### Removing:

- Remove the engine cover. Refer to [“1.6 Engine Cover, Removing and Installing”, page 87](#).
- Remove the air filter housing. Refer to [“3.15 Overview - Air Filter”, page 311](#).
- Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Refer to [“3.15 Overview - Air Filter”, page 311](#). Loosen the spring clamps using the -VAS6362-.
- Remove the intake scoop -Item 35- [⇒ Item 35 \(page 247\)](#).
- Remove the warm air collector plate -Item 2- [⇒ Item 2 \(page 245\)](#).
- Remove the connecting pipe between the exhaust manifold and intake manifold -Item 29- [⇒ Item 29 \(page 246\)](#).
- Remove the charge air pipe -Item 15- [⇒ Item 15 \(page 266\)](#).
- Remove the rear clamp -arrow- from the cylinder head.
- Loosen the union nuts on the oil filter bracket and turbocharger with -T40055- .





- Remove the oil supply line clamp -arrow- on the side of the cylinder head.
- Remove the oil supply line.

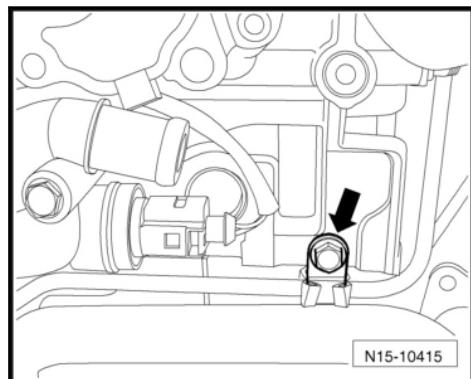
#### Installing:

- Check the oil supply line for leaks.
- Fill the turbocharger with engine oil at the oil supply line connection.

**The Additional Numbered Steps Must Be Followed to Ensure the Oil Supply Line Is Installed Correctly:**

1. Set the union nuts of the oil supply line onto the connections.
2. Tighten the union nut on the oil filter bracket hand-tight.
3. Tighten the union nut on the turbocharger hand-tight.
4. Tighten the union nuts on the oil filter bracket first and then tighten the union nuts on the turbocharger.
- Tightening specification -Item 6- [⇒ Item 6 \(page 165\)](#).
5. Mount the clamps and tighten the bolt and nut.
- Tightening specification 10 Nm.

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:



#### Caution

***Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.***



#### Note

***The connecting pipe between the exhaust manifold and intermediate sprocket must be replaced after removal.***

- Install the connecting pipe between the exhaust manifold and intake manifold -Item 29- [⇒ Item 29 \(page 246\)](#).
- Install the warm air collector plate -Item 2- [⇒ Item 2 \(page 245\)](#).
- Install the intake scoop -Item 35- [⇒ Item 35 \(page 247\)](#).
- Install the charge air pipe -Item 15- [⇒ Item 15 \(page 266\)](#).
- Install the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Refer to [⇒ “3.15 Overview - Air Filter”, page 311](#).
- Install the air filter housing. Refer to [⇒ “3.15 Overview - Air Filter”, page 311](#).
- Install the engine cover. Refer to [⇒ “1.6 Engine Cover, Removing and Installing”, page 87](#).



## 4.4 Oil Pressure and Oil Pressure Switch - F1- , Checking

⇒ “4.4.1 Oil Pressure Switch F1- , Checking”, page 171 .

⇒ “4.4.2 Oil Pressure, Checking”, page 171 .

### 4.4.1 Oil Pressure Switch - F1- , Checking

#### Special tools and workshop equipment required

- ◆ Oil Pressure Gauge Kit - VAG1342-
- ◆ Voltage Tester VAS6839 - VAS6839-
- ◆ Connector Test Set - VAG1594D-
- ◆ Wiring diagram. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations.

#### Test Conditions

- The engine oil level is OK, Checking. Refer to ⇒ “1.3 Engine Oil, Checking Level”, page 138 .

The engine oil temperature is at least 80 °C (176 °F) (the Radiator Fan - V7- must start up once).

#### Test Sequence



##### Note

*Functional check and servicing of the optical and acoustic oil pressure gauge. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations and -VAS6839- “Function and Component Selection”.*

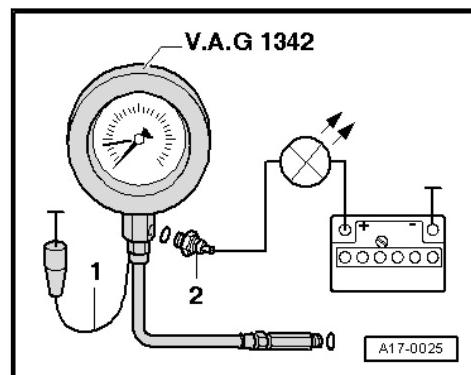
- Disconnect the connector from the Oil Pressure Switch - F1- .
- Remove the Oil Pressure Switch - F1- -2- and install it in the -VAG1342- .
- Install the Tester in place of the Oil Pressure Switch - F1- into the bracket.
- Connect the brown wire -1- of the Tester to the ground.
- Connect the -VAS6839- to Battery - A- positive (+) terminal and the Oil Pressure Switch - F1- using adapter cables from the -VAG1594D- .
- LED must not turn on.

If the LED turns on:

- Replace the Oil Pressure Switch - F1- :
- Tightening specification -Item 7- ⇒ [Item 7 \(page 165\)](#) .

If the LED does not turn on:

- Start the engine and slowly increase the speed:
- LED must light up at 0.55 to 0.85 bar (7.97 to 12.32 psi) pressure, otherwise replace the Oil Pressure Switch - F1- .
- Tightening specification -Item 7- ⇒ [Item 7 \(page 165\)](#) .



### 4.4.2 Oil Pressure, Checking

#### Special tools and workshop equipment required



- ◆ Oil Pressure Gauge Kit - VAG1342-
- ◆ Wiring diagram. Refer to ⇒ [Wiring diagrams, Troubleshooting & Component locations](#).

#### Conditions

- The - VAG1342- is connected. Refer to ⇒ [“4.4.1 Oil Pressure Switch F1, Checking”, page 171](#) , Oil Pressure Switch - F1- , Checking.

#### Test Sequence

- Increase the speed further.
- At 2000 RPM and an oil temperature of 80 °C (176 °F), the oil pressure should be at least 2.0 bar (29 psi).
- At higher engine speeds, the oil pressure must not exceed 7.0 bar (101.52 psi)

If the specified value is not obtained:

- Replace the oil filter bracket if necessary. Refer to ⇒ [“4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 164](#) , Overview - Oil Filter Bracket and Oil Cooler



#### Note

Also, mechanical damage, for example, bearing damage can also be the cause of too low oil pressure.





## 19 – Cooling System

### 1 Cooling System Components

- ⇒ “1.1 General Information”, page 173
- ⇒ “1.2 Overview - Cooling System Components, Body Side”, page 174
- ⇒ “1.3 Cooling System Components, Engine-Side”, page 176
- ⇒ “1.4 Coolant Hose Connection Diagram”, page 183
- ⇒ “1.5 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177, Removing and Installing”, page 188
- ⇒ “1.6 Radiator, Removing and Installing”, page 189
- ⇒ “1.7 Coolant Pump, Removing and Installing”, page 189
- ⇒ “1.8 Coolant Thermostat, Removing and Installing”, page 190
- ⇒ “1.9 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 191
- ⇒ “1.10 Coolant, Draining and Filling”, page 192
- ⇒ “1.11 Cooling System, Checking for Leaks”, page 195
- ⇒ “1.12 Oil Cooler, Checking for Leaks”, page 197
- ⇒ “1.13 Engine Preheater”, page 199

#### 1.1 General Information

##### Special tools and workshop equipment required

- ◆ Hose Clip Pliers - VAS6362-



##### DANGER!

*Risk of scalding due to hot steam and hot coolant:*

- ◆ *The cooling system is under pressure when the engine is warm.*
- ◆ *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- ◆ *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*



##### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations.*
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*



### Note

- ◆ Secure all hose connections with hose clamps appropriate to the model. Refer to the Parts Catalog.
- ◆ Hoses are secured with spring clips. If a repair is required only use spring clips.
- ◆ -VAS6362- or the -VAS6340- are recommended for installing spring clips.
- ◆ When installing coolant hoses without tension, make sure they do not come into contact with other components (observe the marks on the coolant connections and hoses).

## 1.2 Overview - Cooling System Components, Body Side





### 1 - Radiator

- Removing and installing. Refer to ["1.6 Radiator, Removing and Installing", page 189](#).
- Replace all of the coolant after replacing. Refer to ["1.10 Coolant Draining and Filling", page 192](#), Coolant, Draining and Filling

### 2 - O-Ring

- Replace if damaged

### 3 - Upper Coolant Hose

- With a quick-release coupling
- Check for secure fit
- Coolant Hose Connection Diagram. Refer to ["1.4 Coolant Hose Connection Diagram", page 183](#).

### 4 - Cap

- Check the pressure valve in the cap. Refer to ["1.11 Cooling System, Checking for Leaks", page 195](#), Cooling System, Checking for Leaks

### 5 - Connector

### 6 - Bolt

- 3 Nm

### 7 - Coolant Expansion Tank

- Cooling System, Checking for Leaks. Refer to ["1.11 Cooling System, Checking for Leaks", page 195](#).

### 8 - Lower Coolant Hose

- With a quick-release coupling
- Check for secure fit
- Coolant Hose Connection Diagram. Refer to ["1.4 Coolant Hose Connection Diagram", page 183](#).

### 9 - Nut

- 5 Nm

### 10 - Bolt

- 5 Nm

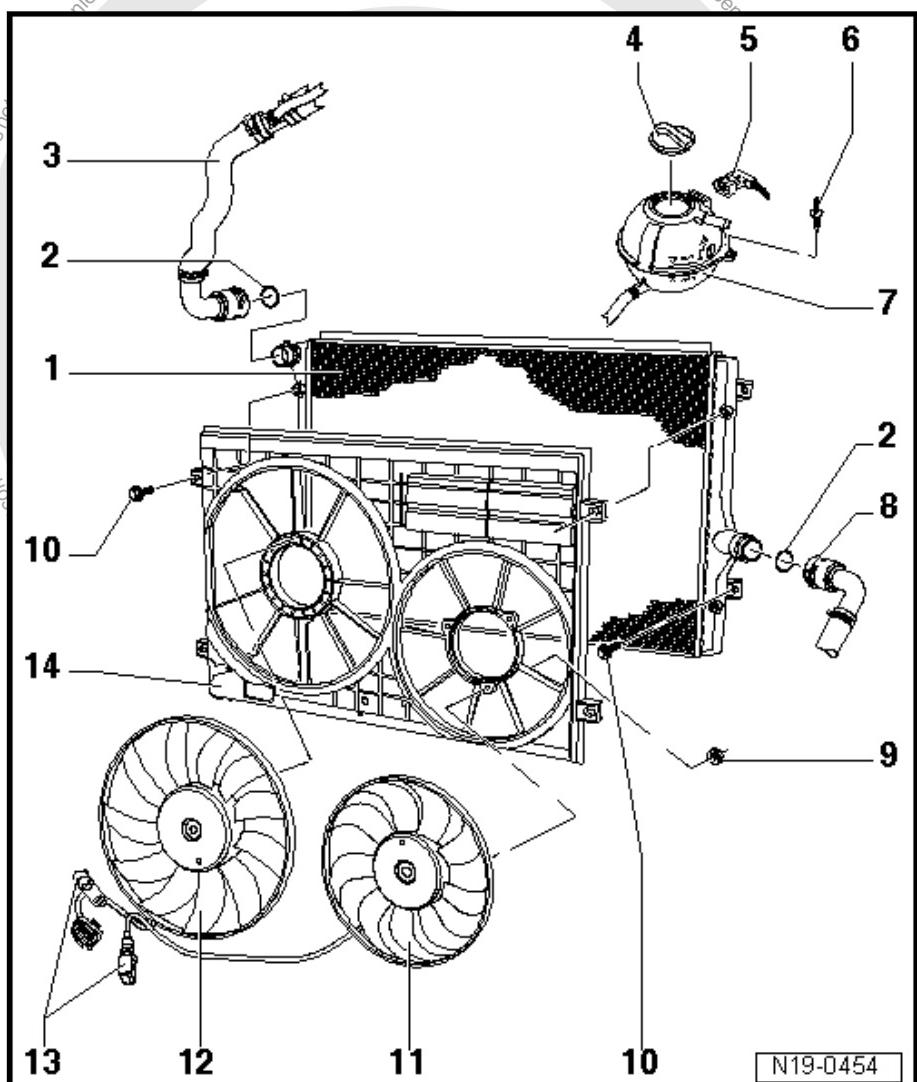
### 11 - Radiator Fan 2 - V177-

### 12 - Radiator Fan - V7-

### 13 - Connector

### 14 - Air Shroud

- Removing and installing. Refer to ["1.5 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177, Removing and Installing", page 188](#).





## 1.3 Cooling System Components, Engine-Side

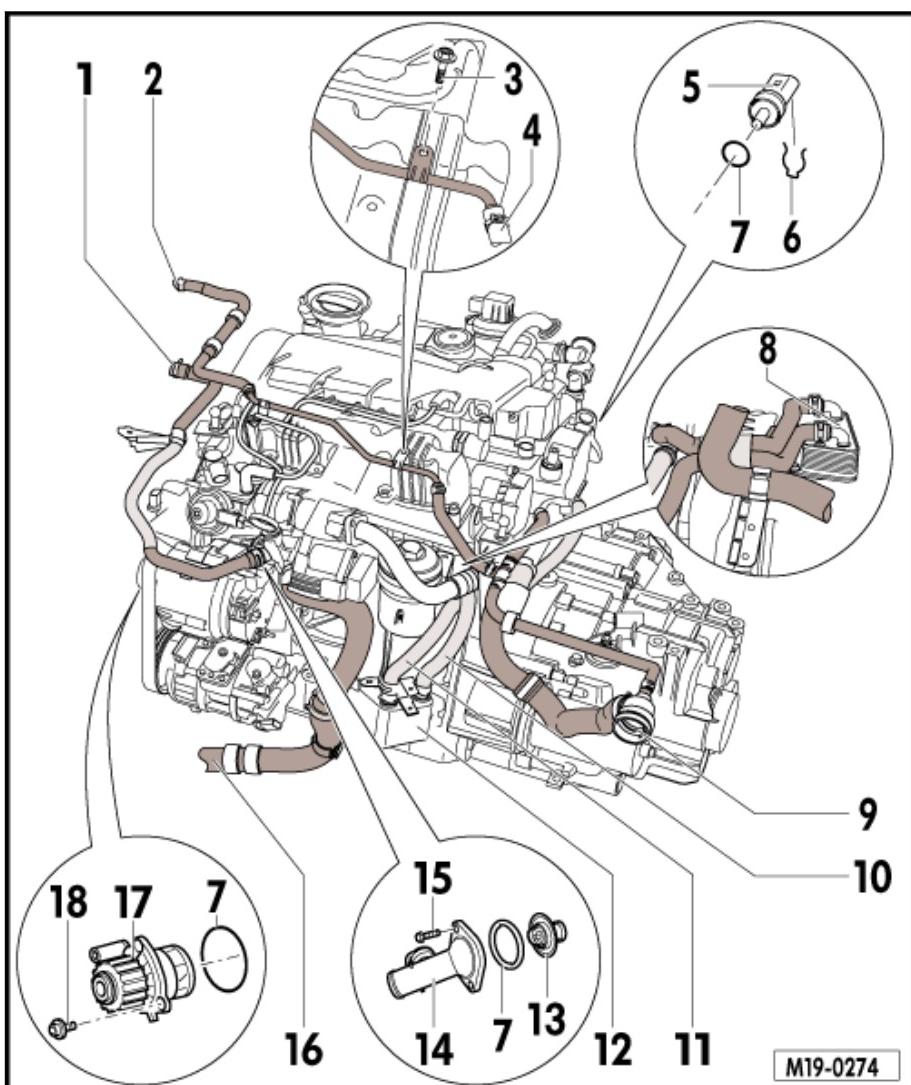
- ⇒ “1.3.1 Overview - Cooling System Components, Intake Side, without Engine Preheater”, page 176 .
- ⇒ “1.3.2 Overview - Cooling System Components, Intake Side, with Engine Preheater”, page 178 .
- ⇒ “1.3.3 Overview - Cooling System Components, Transmission Side”, page 180 .

### 1.3.1 Overview - Cooling System Components, Intake Side, without Engine Preheater

Refer to ⇒ “1.4 Coolant Hose Connection Diagram”, page 183 .



- 1 - Lower Expansion Tank Coolant Hose
- 2 - Upper Expansion Tank Coolant Hose
- 3 - Bolt
  - 10 Nm
- 4 - Bleed Pipe
- 5 - Engine Coolant Temperature Sensor - G62-
- 6 - Clip
- 7 - O-Ring
  - Always replace
- 8 - Transmission Fluid Cooler
  - Only on vehicles with the DSG transmission
- 9 - To the Upper Radiator
- 10 - Engine Oil Cooler Coolant Supply Hose
  - On vehicles without a transmission fluid cooler
- Transmission Fluid Cooler Return Coolant Hose
  - On vehicles with a transmission fluid cooler
- 11 - Engine Oil Cooler Coolant Return Hose
- 12 - Engine Oil Cooler
- 13 - Thermostat/4/2-Way Valve with Thermostat
  - Checking: warm the thermostat in a water bath
  - Starts to open: approximately 87 °C (188.6 °F)
  - Stops opening: approximately 102 °C (215.6 °F)
  - Opening lift: minimum 7 mm
  - Coolant thermostat, removing and installing. Refer to ["1.8 Coolant Thermostat, Removing and Installing", page 190](#).
  - 4/2-Way Valve with Thermostat, Removing and installing. Refer to ["1.9 4/2-Way Valve with Coolant Thermostat, Removing and Installing", page 191](#).
- 14 - Connection
- 15 - Bolt
  - 15 Nm
- 16 - Hose to Lower Radiator
- 17 - Coolant Pump
- 18 - Bolt
  - 15 Nm



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### 1.3.2 Overview - Cooling System Components, Intake Side, with Engine Pre-heater

Refer to [“1.4 Coolant Hose Connection Diagram”, page 183](#).





**1 - Lower Expansion Tank  
Coolant Hose**

**2 - Upper Expansion Tank  
Coolant Hose**

**3 - Bolt**

- 10 Nm

**4 - Bleed Pipe**

**5 - Engine Coolant Tempera-  
ture Sensor - G62-**

**6 - Clip**

**7 - O-Ring**

- Always replace

**8 - Transmission Fluid Cooler**

- Only on vehicles with  
the DSG® transmission

**9 - Engine Oil Cooler Coolant  
Supply Hose**

- On vehicles without a  
transmission fluid cooler
- From the connection on  
the cylinder block

**Transmission Fluid Cooler  
Return Coolant Hose**

- On vehicles with a  
transmission fluid cooler

**10 - Engine Oil Cooler Cool-  
ant Return Hose**

**11 - To the Upper Radiator**

**12 - Bracket for Wiring Harness and Coolant Pipe**

- Secured on the oil filter bracket -Item 16- [⇒ Item 16 \(page 166\)](#)

**13 - Coolant Hose**

- To the coolant pipe on the cylinder block

**14 - Coolant Hoses**

- For the transmission fluid cooler
- Only on vehicles with the DSG® transmission

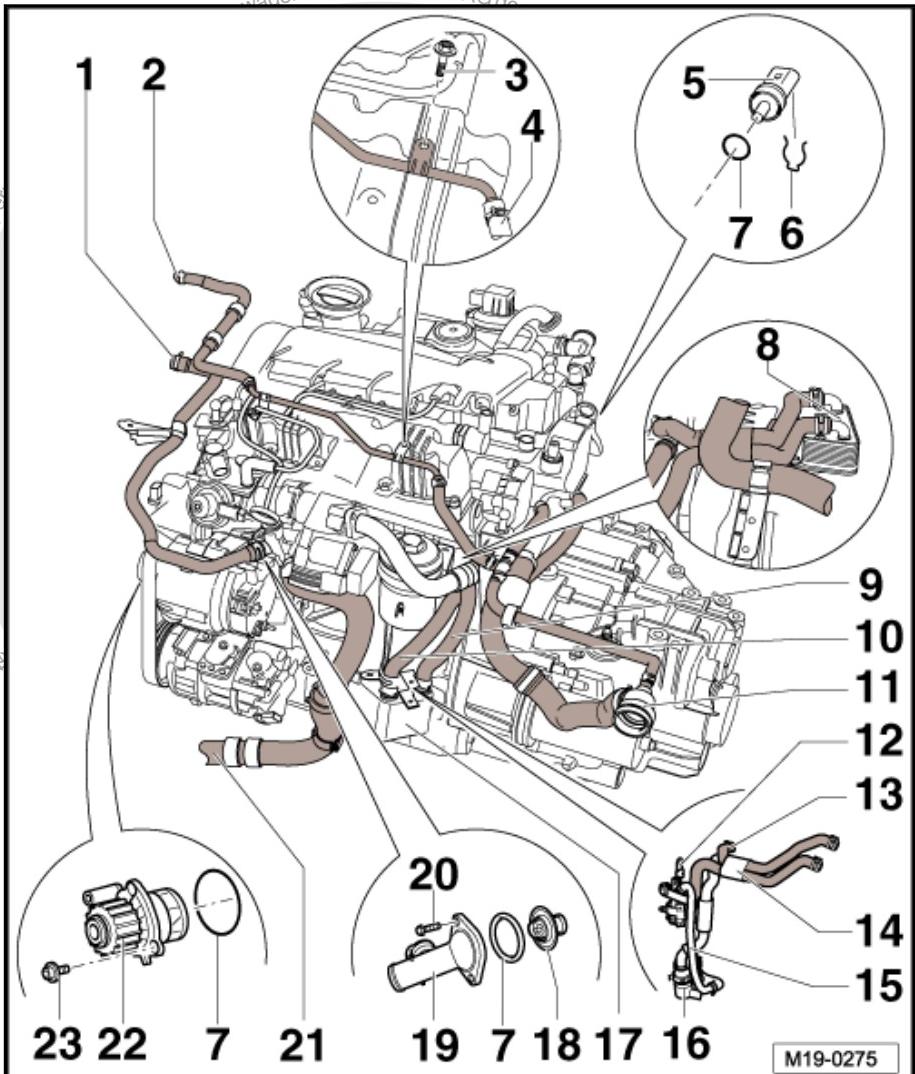
**15 - Coolant Pipe**

- For the engine preheater
- Overview. Refer to [⇒ “1.13.1 Overview - Engine Preheater”, page 199](#).
- Connection to the engine preheater and the engine oil cooler return line -Item 10- [⇒ Item 10 \(page 179\)](#)
- Secured in the upper area on the bracket for the wiring harness and coolant pipe -Item 16- [⇒ Item 16 \(page 166\)](#)
- Secured in the lower area on the charge air pipe with the engine preheater bracket

-Item 15- [⇒ Item 15 \(page 266\)](#)

**16 - Engine Preheater**

- Overview. Refer to [⇒ “1.13.1 Overview - Engine Preheater”, page 199](#).
- Removing and installing. Refer to [⇒ “1.13.2 Engine Preheater, Removing and Installing”, page 200](#).



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## 17 - Engine Oil Cooler

## 18 - Coolant Thermostat

- Checking: warm the thermostat in a water bath
- Starts to open: approximately 87 °C (188.6 °F)
- Stops opening: approximately 102 °C (215.6 °F)
- Opening lift: minimum 7 mm
- Coolant thermostat, removing and installing. Refer to [“1.8 Coolant Thermostat, Removing and Installing”, page 190](#).
- 4/2-Way Valve with Thermostat, Removing and installing. Refer to [“1.9 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 191](#).

## 19 - Connection

## 20 - Bolt

- 15 Nm

## 21 - Hose to Lower Radiator

## 22 - Coolant Pump

## 23 - Bolt

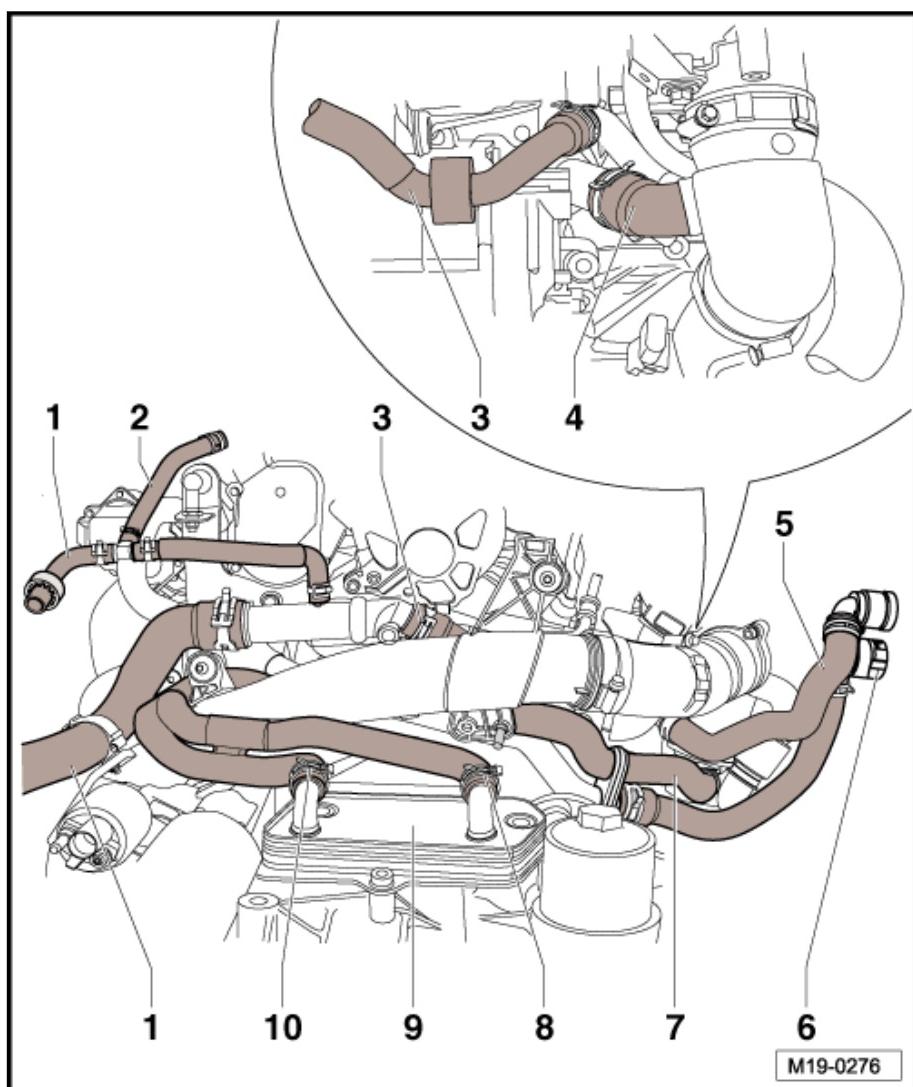
- 15 Nm

### 1.3.3 Overview - Cooling System Components, Transmission Side

Coolant Hose Connection Diagram. Refer to [“1.4 Coolant Hose Connection Diagram”, page 183](#).



- 1 - Coolant Supply Hose
- 2 - Coolant Hose to the Ventilation Pipe -Item 4- [⇒ Item 4 \(page 179\)](#)
- 3 - EGR Cooler Coolant Return Hose
  - EGR cooler installation position -Item 6- [⇒ Item 6 \(page 380\)](#)
- 4 - Radiator Return Coolant Hose
- 5 - Heat Exchanger Coolant Supply Hose
- 6 - Heat Exchanger Coolant Return Hose
- 7 - EGR Cooler Coolant Supply Hose
- 8 - Transmission Fluid Cooler Coolant Supply Hose
- 9 - Transmission Fluid Cooler
- 10 - »Transmission Fluid Cooler Return« Coolant Hose



#### 1.3.4 Overview - Cooling System Components, Engine-Side, Engine Codes CBDA, CBDB and CEGA

Coolant Hose Connection Diagram. Refer to [⇒ “1.4 Coolant Hose Connection Diagram”, page 183](#).



**1 - Grommet**

- Not available separately.

**2 - Sleeve**

- Not available separately.

**3 - 2.7 Nm**

**4 - 40 Nm**

**5 - Bracket**

- For Engine Coolant Circulation Pump 2 - V178-

**6 - Front Coolant Pipe**

**7 - O-Ring**

- Always replace

**8 - Right Coolant Pipe**

**9 - O-Ring**

- Always replace

**10 - Engine Coolant Temperature Sensor on Radiator Outlet - G83-**

**11 - Clip**

**12 - 9 Nm**

**13 - 9 Nm**

**14 - 9 Nm**

**15 - Coolant Line**

**16 - 9 Nm**

**17 - Seal**

- Always replace

**18 - Connection**

**19 - 9 Nm**

**20 - Clip**

**21 - Engine Coolant Temperature Sensor - G62-**

**22 - O-Ring**

- Always replace

**23 - Double Bolt**

- 9 Nm

**24 - 9 Nm**

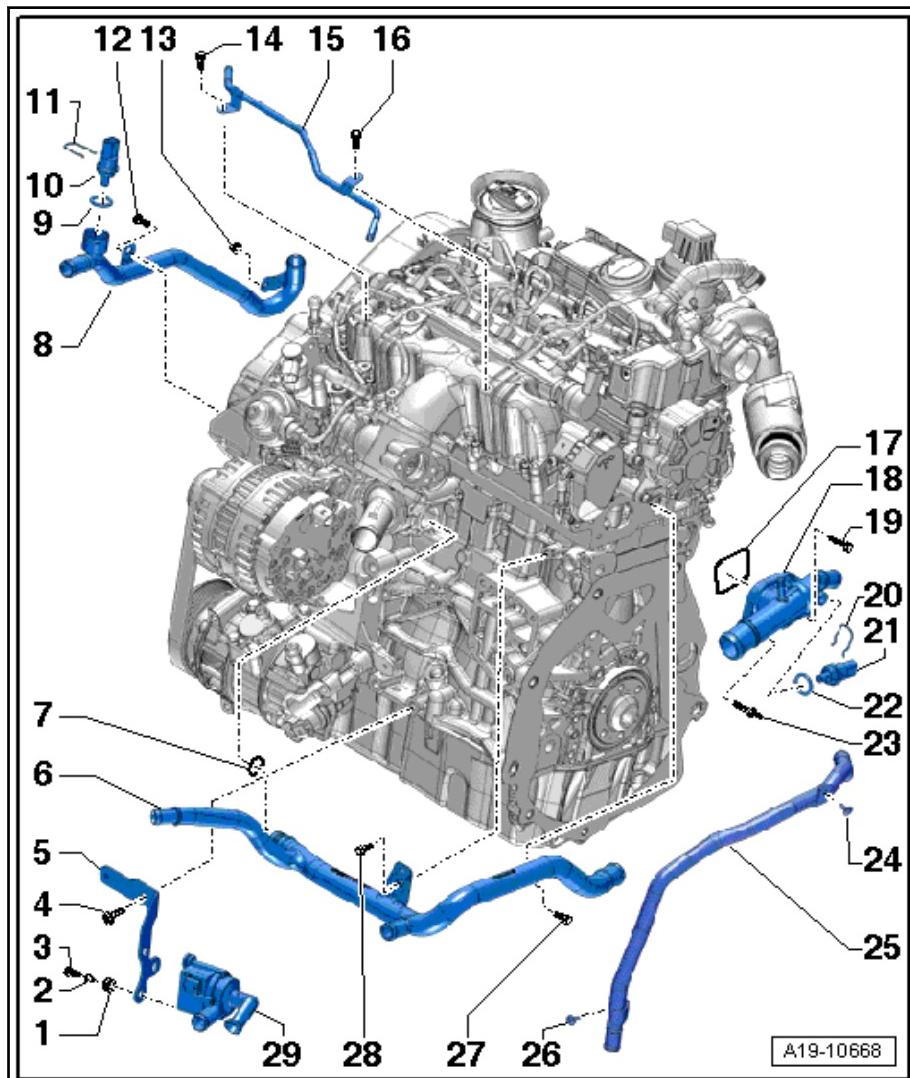
**25 - Left Coolant Pipe**

**26 - 9 Nm**

**27 - 40 Nm**

**28 - 13 Nm**

**29 - Engine Coolant Circulation Pump 2 - V178-**



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## 1.4 Coolant Hose Connection Diagram

⇒ “1.4.1 Coolant Hose Connection Diagram, without Engine Preheater”, page 183

⇒ “1.4.2 Coolant Hose Connection Diagram, with Engine Preheater”, page 183

⇒ “1.4.4 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, All Vehicles Except Jetta from MY 2011”, page 185

⇒ “1.4.5 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, Only Jetta from MY 2011”, page 186

### 1.4.1 Coolant Hose Connection Diagram, without Engine Preheater

#### 1 - Coolant Expansion Tank

- With cap
- Pressure relief valve inside cap, checking. Refer to ⇒ “1.11.2 Pressure Relief Valve in Cap, Checking”, page 197 .

#### 2 - Cylinder Head/Cylinder Block

- Change the coolant after replacing

#### 3 - EGR Cooler

- Change the coolant after replacing
- Overview. Refer to ⇒ “3 Exhaust Gas Recirculation (EGR)”, page 378 .

#### 4 - Heater Core for the Heater

- With a quick-release coupling

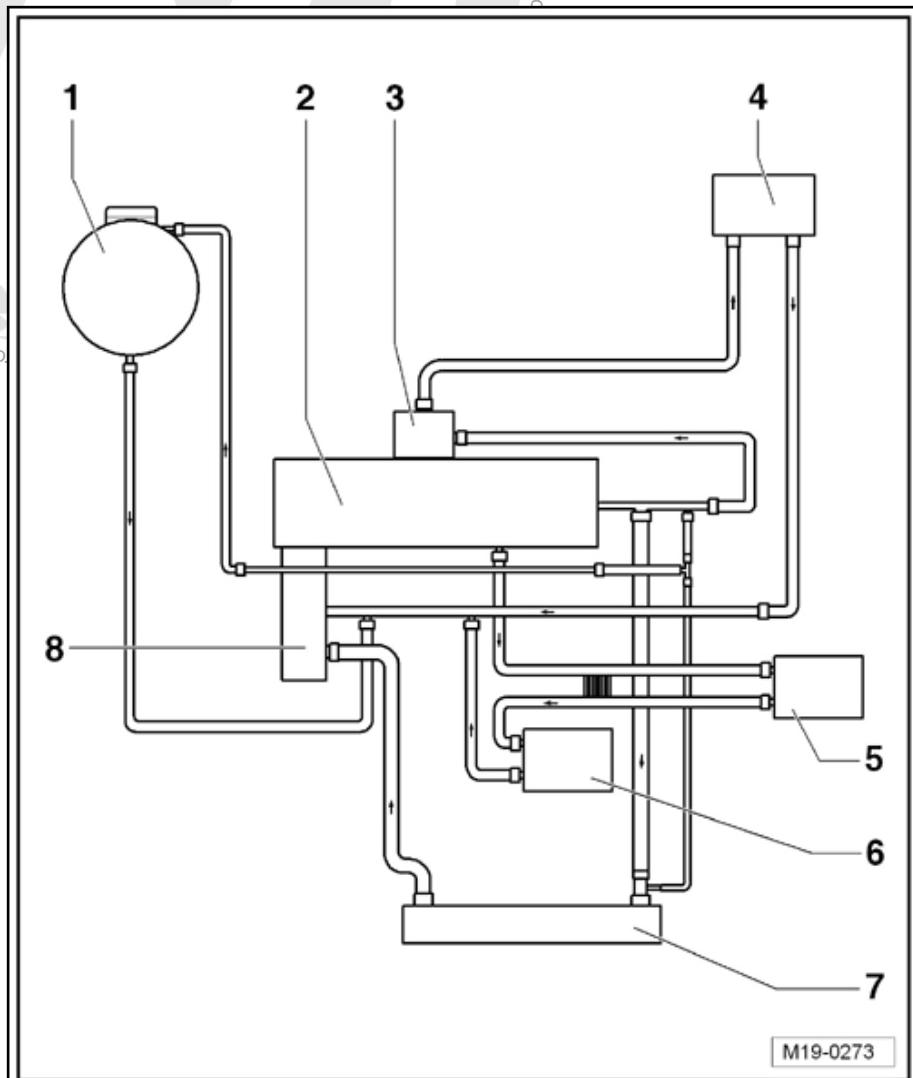
#### 5 - Transmission Fluid Cooler

- Only on vehicles with the DSG® transmission

#### 6 - Engine Oil Cooler

#### 7 - Radiator

#### 8 - Coolant Pump/Coolant Thermostat



### 1.4.2 Coolant Hose Connection Diagram, with Engine Preheater



#### 1 - Coolant Expansion Tank

- With cap
- Pressure relief valve inside cap, checking. Refer to ["1.11.2 Pressure Relief Valve in Cap, Checking"](#), page 197 .

#### 2 - Cylinder Head/Cylinder Block

- Change the coolant after replacing

#### 3 - EGR Cooler

- Change the coolant after replacing
- Overview. Refer to ["3 Exhaust Gas Recirculation \(EGR\)"](#), page 378 .

#### 4 - Heater Core for the Heater

- With a quick-release coupling

#### 5 - Transmission Fluid Cooler

- Only on vehicles with the DSG® transmission

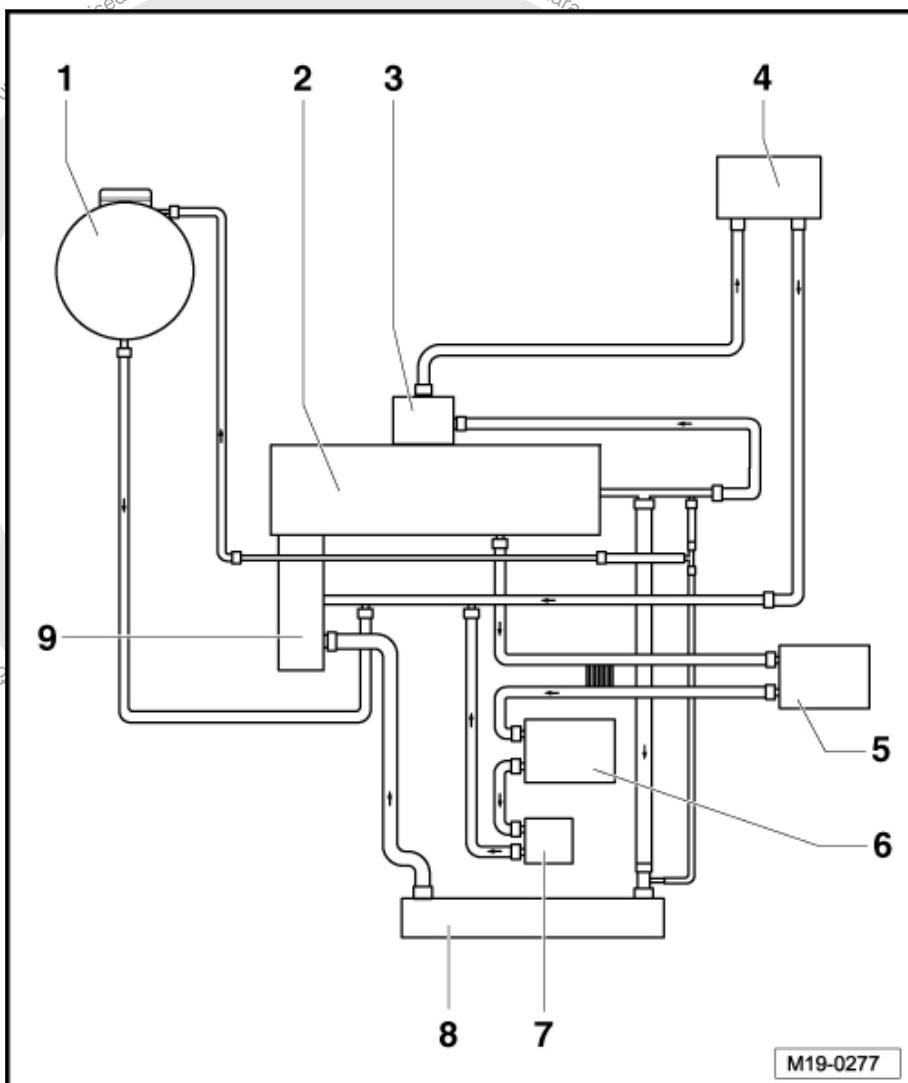
#### 6 - Engine Oil Cooler

#### 7 - Engine Preheater

- Overview. Refer to ["1.13.1 Overview - Engine Preheater"](#), page 199 .
- Removing and installing. Refer to ["1.13.2 Engine Preheater, Removing and Installing"](#), page 200 .

#### 8 - Radiator

#### 9 - Coolant Pump/Coolant Thermostat



### 1.4.3 Coolant Hose Connection Diagram, Engine Codes CBDA, CBDB and CEGA



### 1 - Coolant Expansion Tank

- With cap
- Pressure relief valve inside cap, checking. Refer to ["1.11.2 Pressure Relief Valve in Cap, Checking", page 197](#).

### 2 - EGR Cooler

- Change the coolant after replacing
- Overview. Refer to ["3 Exhaust Gas Recirculation \(EGR\)", page 378](#).

### 3 - Heater Core for the Heater

- With a quick-release coupling

### 4 - Cylinder Head/Cylinder Block

- Change the coolant after replacing

### 5 - Engine Oil Cooler

### 6 - Engine Coolant Circulation Pump 2 - V178-

### 7 - Upper Coolant Hose

- With a quick-release coupling

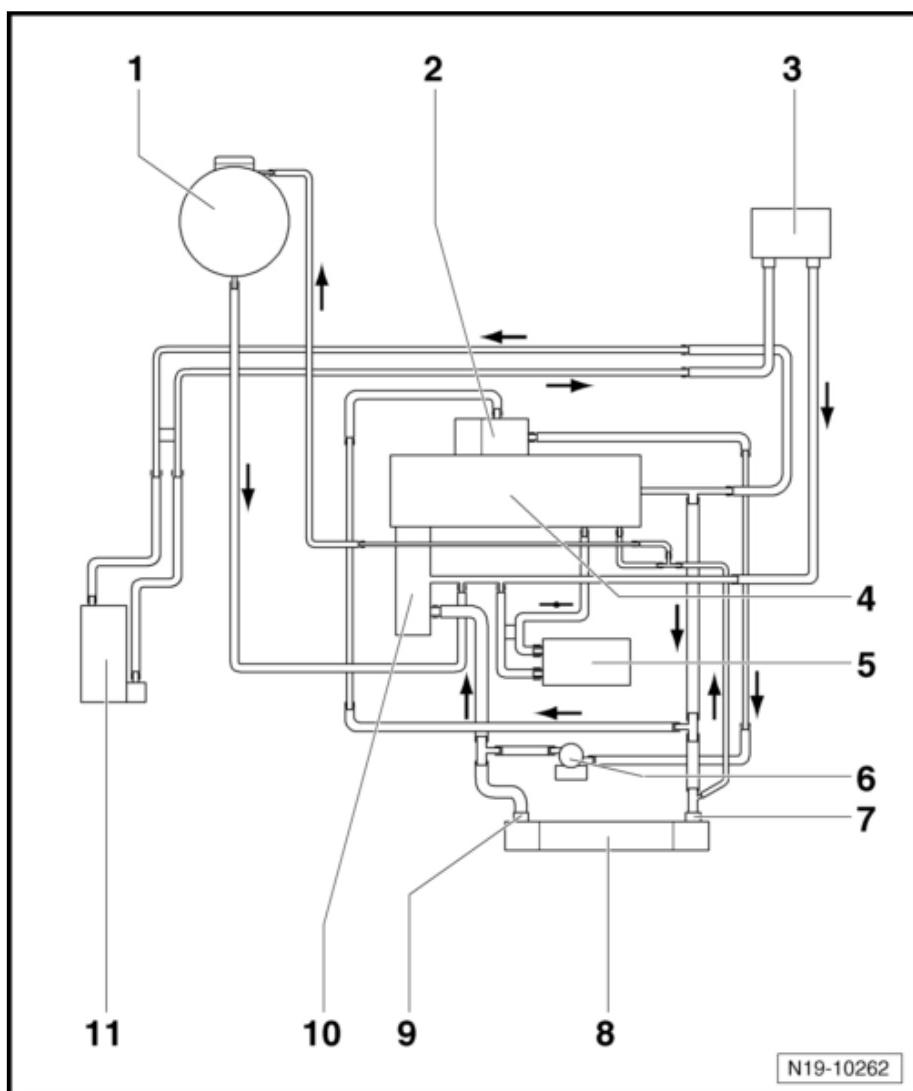
### 8 - Radiator

### 9 - Lower Coolant Hose

- With a quick-release coupling

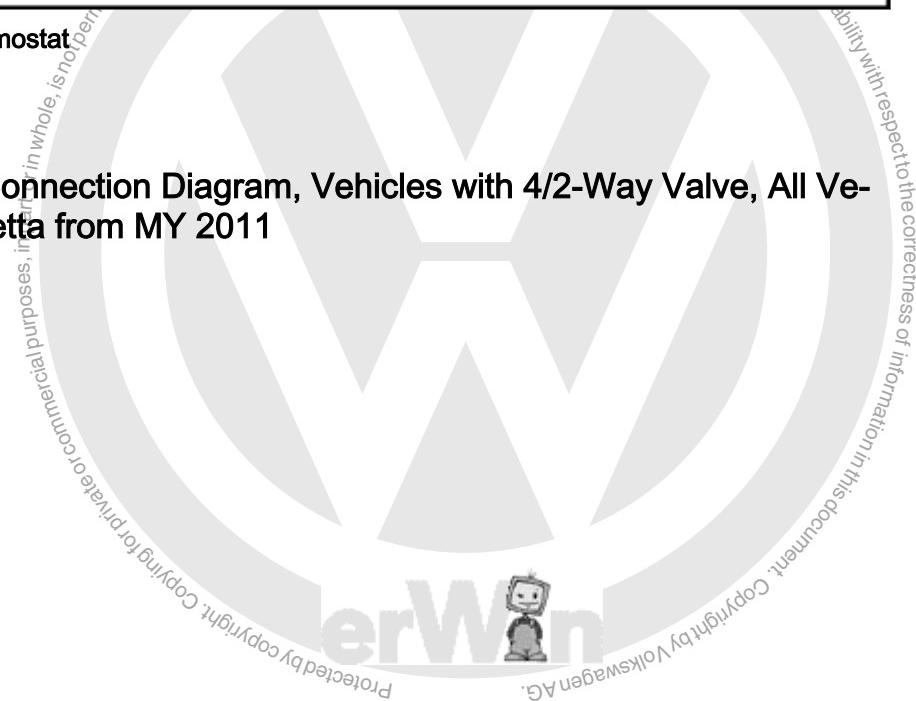
### 10 - Coolant Pump/Coolant Thermostat

### 11 - Auxiliary Heater



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### 1.4.4 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, All Vehicles Except Jetta from MY 2011





**1 - Radiator**

**2 - Engine Coolant Circulation Pump 2 - V178-**

**3 - Engine Oil Cooler**

**4 - 4/2-Way Valve**

- With coolant thermostat
- Removing and installing. Refer to ["1.9 4/2-Way Valve with Coolant Thermostat, Removing and Installing", page 191](#).

**5 - Coolant Pump**

- Removing and installing. Refer to ["1.7 Coolant Pump, Removing and Installing", page 189](#).

**6 - Cylinder Head/Cylinder Block**

- Change the coolant after replacing

**7 - Coolant Expansion Tank**

- With cap
- Pressure relief valve inside cap, checking. Refer to ["1.11.2 Pressure Relief Valve in Cap, Checking", page 197](#).

**8 - EGR Cooler**

- Change the coolant after replacing
- Overview. Refer to ["3 Exhaust Gas Recirculation \(EGR\)", page 378](#).

**9 - Auxiliary/Parking Heater**

- Depending on the equipment

**10 - Recirculation Pump - V55-**

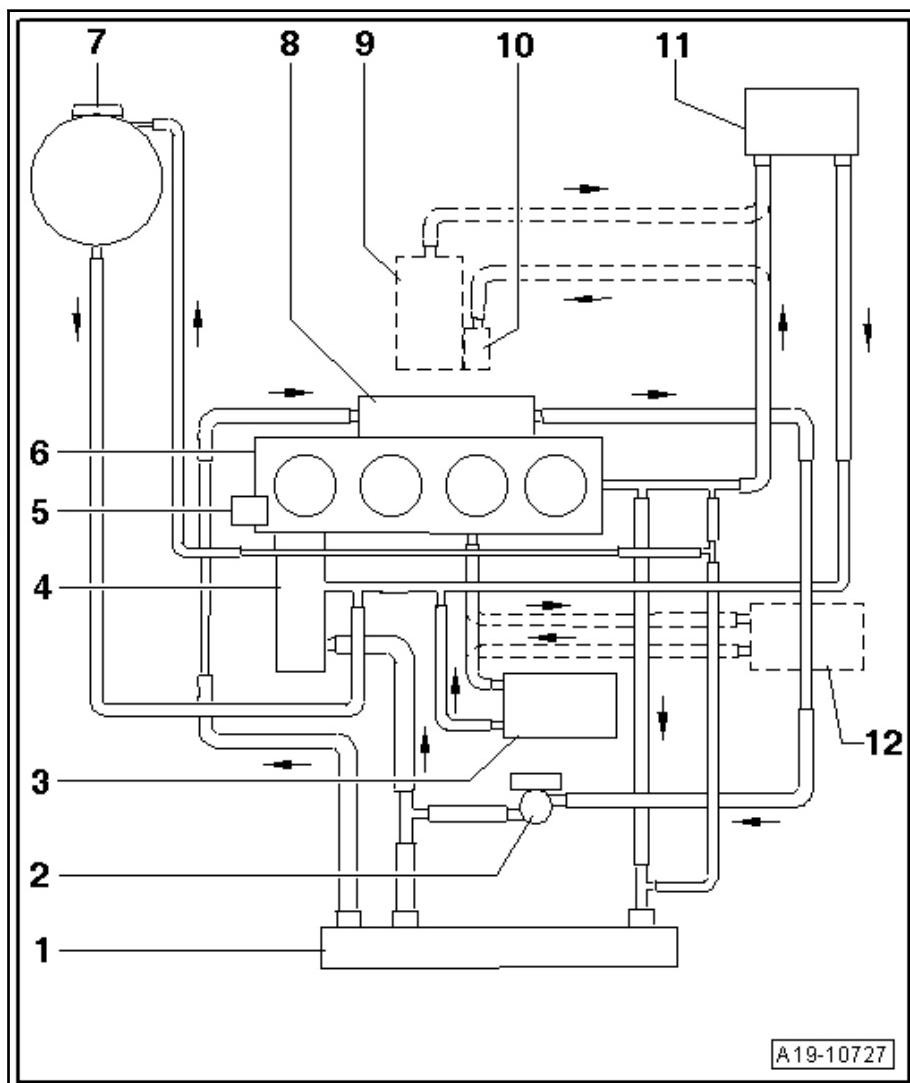
- Depending on the equipment

**11 - Heater Core for the Heater**

- With a quick-release coupling

**12 - Transmission Fluid Cooler**

- Only for vehicles with a DSG® transmission/automatic transmission



#### 1.4.5 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, Only Jetta from MY 2011



### 1 - Coolant Expansion Tank

- With cap
- Pressure relief valve inside cap, checking. Refer to ["1.11.2 Pressure Relief Valve in Cap, Checking", page 197](#).

### 2 - Cylinder Head/Cylinder Block

- Change the coolant after replacing

### 3 - EGR Cooler

- Change the coolant after replacing
- Overview. Refer to ["3 Exhaust Gas Recirculation \(EGR\)", page 378](#)

### 4 - Auxiliary/Parking Heater

- Depending on the equipment

### 5 - Recirculation Pump - V55-

- Depending on the equipment

### 6 - Heater Core for the Heater

- Change the coolant after replacing

### 7 - Transmission Fluid Cooler

- Only for vehicles with a DSG® transmission/automatic transmission

### 8 - Engine Oil Cooler

### 9 - Engine Preheater

- Overview. Refer to ["1.13.1 Overview - Engine Preheater", page 199](#).
- Removing and installing. Refer to ["1.13.2 Engine Preheater, Removing and Installing", page 200](#).

### 10 - Radiator

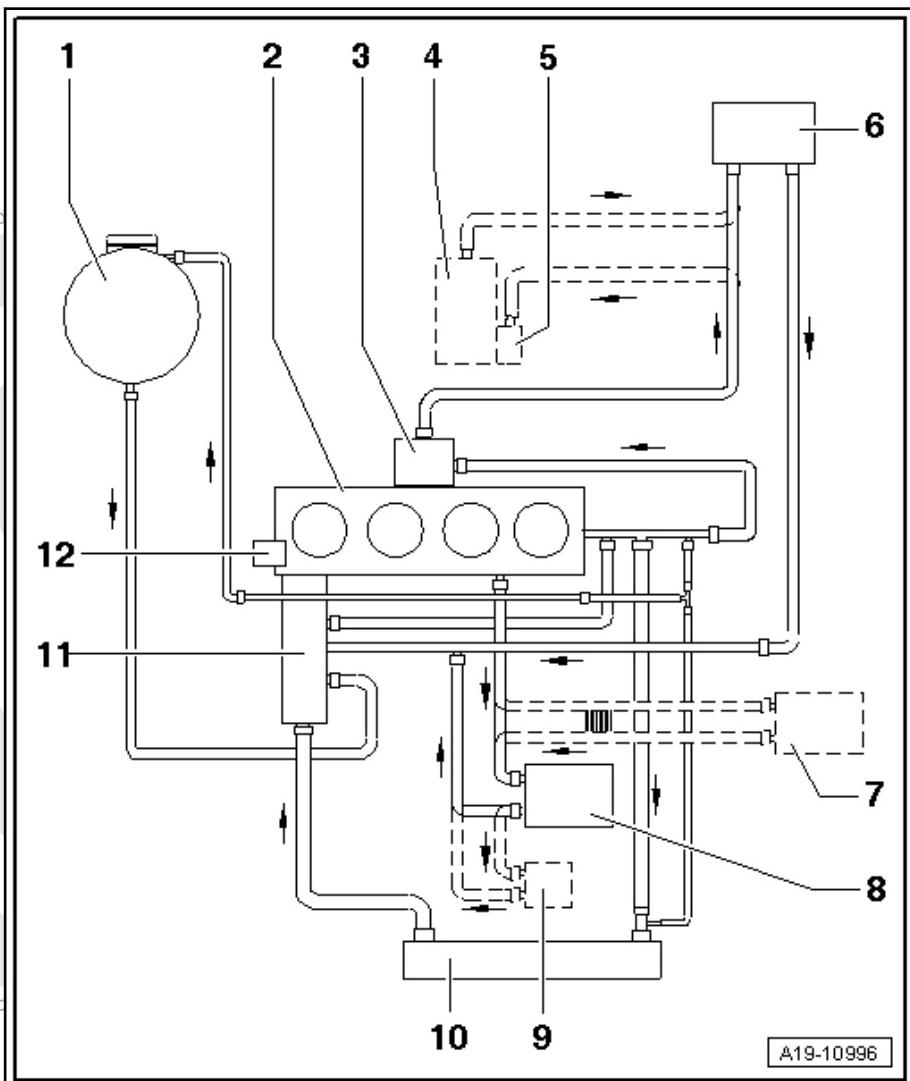
- Removing and installing. Refer to ["1.6 Radiator, Removing and Installing", page 189](#).
- Change the coolant after replacing

### 11 - 4/2-Way Valve

- With coolant thermostat
- Removing and installing. Refer to ["1.9 4/2-Way Valve with Coolant Thermostat, Removing and Installing", page 191](#).

### 12 - Coolant Pump

- Removing and installing. Refer to ["1.7 Coolant Pump, Removing and Installing", page 189](#).



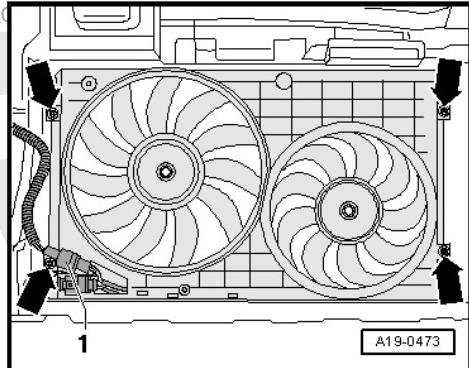
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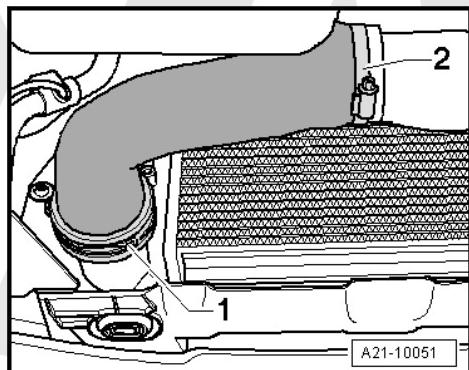
## 1.5 Air Shroud with Radiator Fan - V7- and Radiator Fan 2 - V177- , Removing and Installing

### Removing

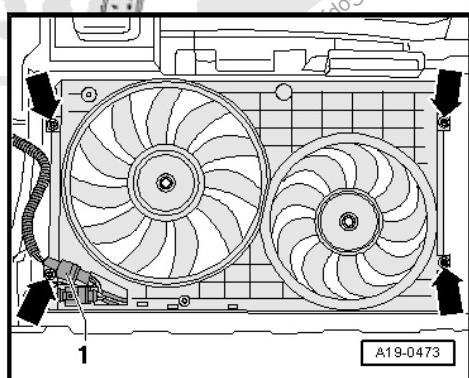
- Remove the screws -upper arrows- from the air shroud.
- Remove the noise insulation. Refer to ⇒ Body Exterior, Rep. Gr. 50 ; Noise Insulation .



- Remove the »hot side« connecting hose to the charge air pipe. Loosen the hose clamp -2- and lift the clip -1-.



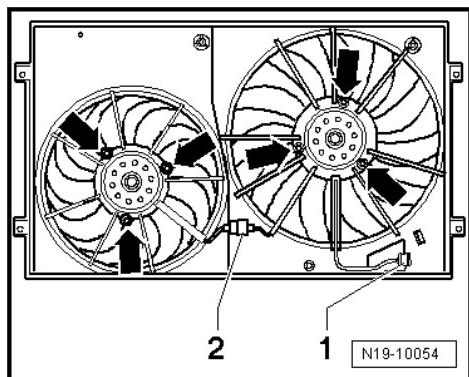
- Disconnect the connector -1-.
- Remove the bottom screw -lower arrow-.
- Remove the air shroud and the radiator fans upward.
- Disconnect the connector -1- and (if equipped) -2- and free up the wires.



- Remove the nuts -arrows- and remove the radiator fans.

### Installing

Install in reverse order of removal.





## 1.6 Radiator, Removing and Installing

### Special tools and workshop equipment required

- ◆ Refractometer - T10007A-
- ◆ Torque Wrench 1783 - 2-10Nm - VAG1783-
- ◆ Shop Crane - Drip Tray - VAS6208-

### Removing:

- Drain the coolant. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).
- Remove the clamp from the upper coolant hose and pull the coolant hose from the radiator quick-release coupling.
- Remove the Radiator Fan - V7- connector.
- Remove the bolts on the radiator -Item 10- [⇒ Item 10 \(page 175\)](#) and remove the radiator with the Radiator Fan - V7- upward.

### Installing:

Install in reverse order of removal. Note the following:

- Tightening specification for radiator bolts -Item 10- [⇒ Item 10 \(page 175\)](#).
- Fill with coolant. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).

## 1.7 Coolant Pump, Removing and Installing

### Special tools and workshop equipment required

- ◆ Refractometer - T10007A-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331
- ◆ Hose Clip Pliers - VAS6362-

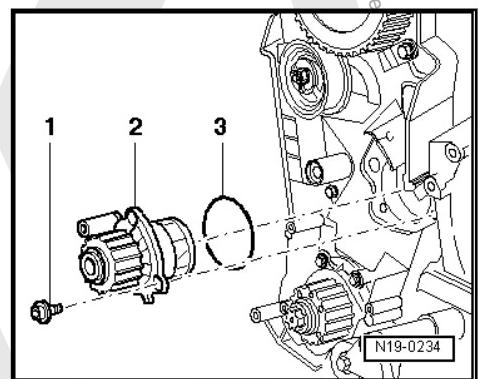
### Removing:

- Drain the coolant. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).
- Remove the toothed belt. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#).
- Remove the bolts -1- of the coolant pump -2- and carefully take out the coolant pump.

### Installing:

Install in reverse order of removal. Note the following:

- Replace the seals, gaskets and O-rings.



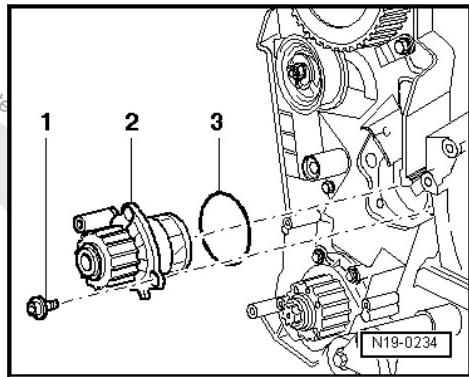


- Coat the new O-ring -3- with coolant.
- Insert the coolant pump -2- in the cylinder block and tighten the bolts -1-.
- Tightening specification, 15 Nm



**Note**

The plug from the coolant pump faces downward.



- Installing and tensioning the toothed belt. Refer to [“1.8 Toothed Belt, Removing, Installing and Tensioning”, page 92](#).
- Fill with coolant. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).

## 1.8 Coolant Thermostat, Removing and Installing

### Special tools and workshop equipment required

- ◆ T Bar And Socket - 10mm - 3185-
- ◆ Refractometer - T10007A-
- ◆ Hex Ball Socket - T10058-
- ◆ Torque Wrench 1331.5-50Nm - VAG1331-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Hose Clip Pliers - VAS6362-

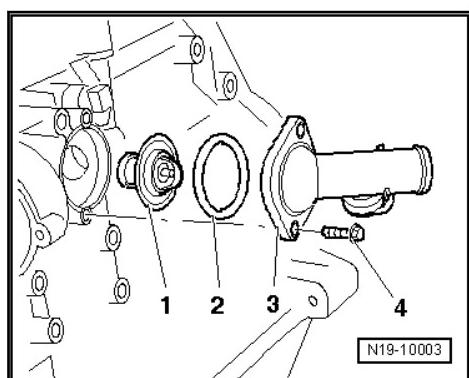
### Removing:

- Drain the coolant. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).
- Remove the Throttle Valve Control Module - J338-. Refer to [“3.13 Overview - Intake Manifold with Attachments”, page 307](#), Overview - Intake Manifold with Attachments
- Remove the coolant hose from the connection.
- Loosen the bolts -4- from the connection -3- with - 3185- and remove using the - T10058- and remove the connection -3- with the coolant thermostat -1-.
- Turn the thermostat -1- 1/4 turn (90°) to the left and remove it from the connection -3-.

### Installing:

Install in reverse order of removal. Note the following:

- Replace the seals, gaskets and O-rings.



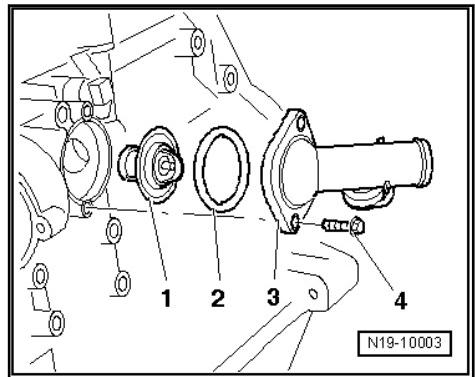


- Coat the new O-ring -2- with coolant.
- Insert the coolant thermostat -1- into the connection -3- and turn it  $\frac{1}{4}$  turn ( $90^\circ$ ) to the right.

**Note**

*The clip of thermostat must be positioned at approximately a right angle.*

- Install the connection -3- and the thermostat -1- in the cylinder block.
- Tighten the bolts -4- with - 3185- .
- Tightening specification, 15 Nm
- Secure the coolant hose to the connection.
- Install the Throttle Valve Control Module - J338- . Refer to [⇒ “3.13 Overview - Intake Manifold with Attachments”, page 307](#), Overview - Intake Manifold with Attachments
- Fill with coolant. Refer to [⇒ “1.10 Coolant, Draining and Filling”, page 192](#).



## 1.9 4/2-Way Valve with Coolant Thermostat, Removing and Installing

### Special tools and workshop equipment required

- ◆ T Bar And Socket - 10mm - 3185-
- ◆ Refractometer - T10007A-
- ◆ Hex Ball Socket - T10058-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Hose Clip Pliers - VAS6340-
- ◆ Swivel Socket - Xzn 8 - T10445-

### Removing

**Note**

*The thermostat is inside the 4/2-way valve and cannot be replaced separately.*

- Drain the coolant. Refer to [⇒ “1.10 Coolant, Draining and Filling”, page 192](#).
- Remove the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Remove the Throttle Valve Control Module - J338- . Refer to [⇒ “3.13 Overview - Intake Manifold with Attachments”, page 307](#).

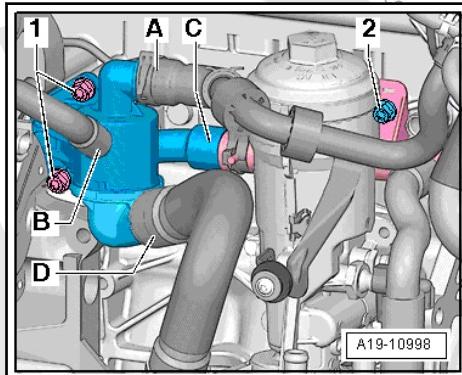


- Remove the coolant hoses -A, B and D-.
- Remove the bolt -2- using the -T10445- .
- Remove the bolts -1-.
- Remove the valve from the cylinder block and pull the connection -C- off the coolant pipe.

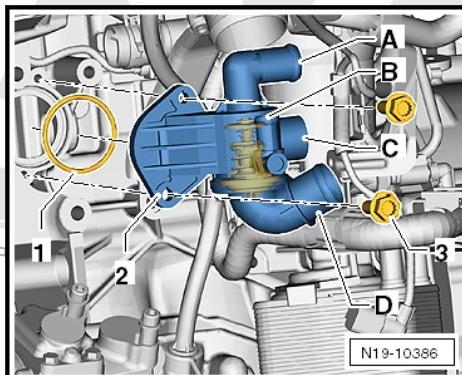
#### Installing



Replace the gaskets and seals.



- First attach the 4/2-way valve and the connection -C- to the coolant pipe and then install them in the cylinder block.
- Install the screws -3- and tighten them to 15 Nm.
- Connect the coolant hoses as follows:
  - ◆ -A: bypass line to the cylinder head
  - ◆ -B: reservoir
  - ◆ -D: radiator return line
- Tighten the bolt on the coolant pipe behind the oil filter. Use the -T10445-. Tightening specification: 10 Nm.
- Fill the cooling system. Refer to ⇒ [“1.10 Coolant, Draining and Filling”, page 192](#).
- Install the Throttle Valve Control Module - J338-. Refer to ⇒ [“3.13 Overview - Intake Manifold with Attachments”, page 307](#).
- Install the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .



## 1.10 Coolant, Draining and Filling

### Special tools and workshop equipment required

- ◆ Refractometer - T10007A-
- ◆ Drip Tray - VAG1306-
- ◆ Hose Clip Pliers - VAS6362-
- ◆ Cooling System Charge Kit - VAS6096-
- ◆ Cooling System Tester - Adapter - VAG1274/8-

### Draining:



#### DANGER!

*Risk of scalding due to hot steam and hot coolant:*

- ◆ *The cooling system is under pressure when the engine is warm.*
- ◆ *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- ◆ *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*



Note

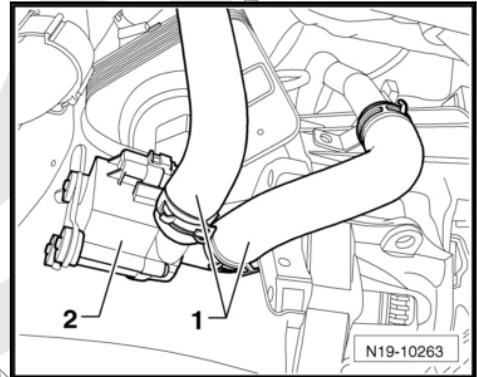
- ◆ Drained coolant must be stored in a clean container for disposal or reuse.
- ◆ Follow all waste disposal regulations.
- Open the cap on the coolant expansion tank.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .



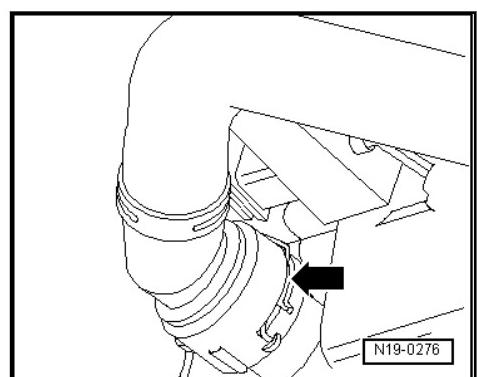
Note

Catch leaking coolant with the -VAS6208- .

- Place the -VAS6208- under the engine.
- Remove the coolant hoses -1- on the Coolant Recirculation Pump 2 - V178- -2-.



- Remove the coolant hose clip -arrow- downward and remove the coolant hose from the radiator quick-release coupling.





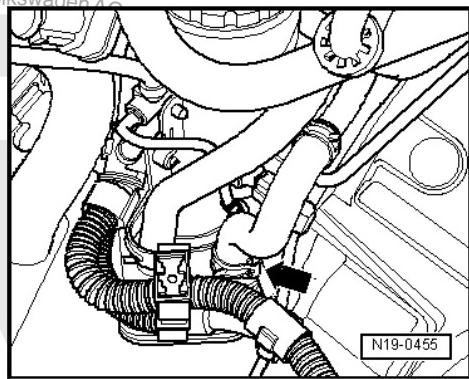
- In addition, to drain the coolant from the engine, disconnect the coolant hose at the oil cooler -arrow-.

**Filling:**



**Caution**

*Only use distilled water for mixing with G12 plus plus. Using distilled water provides optimum corrosion protection.*



**Note**

- ◆ Only use coolant additive G 12 Plus Plus that conforms to TL VW774 G.
- ◆ Use distilled water for mixing.
- ◆ G12 plus-plus prevents freeze and corrosion damage and scaling and it increases the boiling temperature. For this reason the cooling system must be filled all year round with coolant and corrosion protection additives.
- ◆ Because of its high boiling point, the coolant contributes to engine reliability under heavy engine loads, particularly in countries with tropical climates.
- ◆ Freeze protection should be guaranteed to about -25 °C (-13 °F) (in countries with arctic climates: to about -35 °C (-31 °F)).
- ◆ The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive portion must be at least 40%.
- ◆ If a stronger freeze protection is required, the G12 plus-plus ratio can be increased.
- ◆ But only up to 60% (freeze protection down to approximately -40 °C (-40 °F)). Otherwise the freeze protection is lessened and the cooling effect will be diminished.
- ◆ Do not use the old coolant again if replacing the radiator, heater core, cylinder head or cylinder head gasket.
- ◆ The -T10007- is recommended for determining the current freeze protection density.

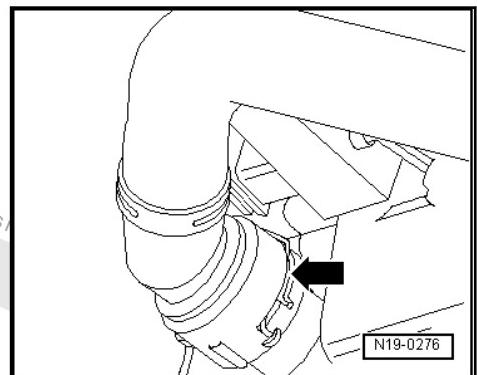
**Recommended Mixture Ratios:**

Frost Protection to	Freeze Protection Portion	-G 12 plus-plus-. Refer to <sup>3)</sup> .	Distilled Water. Refer to <sup>3)</sup> ,
-25 °C (-13 °F)	40 %	3.2 liters (3.38 quarts)	4.8 liters (5.07 quarts)
-35 °C (-31 °F)	50 %	4.0 liters (4.22 quarts)	4.0 liters (4.22 quarts)

3) The coolant quantity can vary depending upon the vehicle equipment.



- Install the lower coolant hose and secure with the clamp -arrow-.

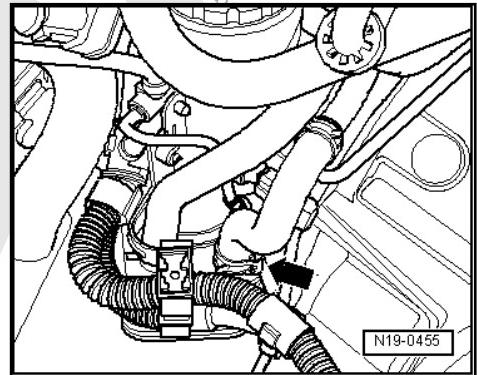


- Connect the coolant hose to the oil cooler -arrow-.
- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

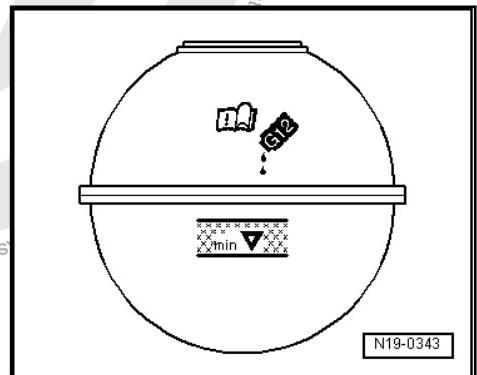
**With -VAS6096- :**

- Install the -VAG1274/8- in the coolant expansion tank.
- Fill the coolant circuit using -VAS6096- . Refer to Operating Instructions for Cooling System Charge Kit VAS6096.

**Without -VAS6096- :**



- Slowly fill the coolant up to the upper marking in the hatched area on the expansion tank.
- Seal the coolant expansion tank.
- Start the engine and keep the engine speed at about 2000 RPM for approximately three minutes.
- Let the engine run in idle until the Radiator Fan - V7- switches on.



### DANGER!

*Risk of scalding due to hot steam and hot coolant:*

- ◆ *The cooling system is under pressure when the engine is warm.*
- ◆ *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- ◆ *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*

- Check the coolant level and fill if necessary.
- When engine is warm, coolant level must be at top marking and when the engine is cold, it must be in the middle of the hatched field.

## 1.11 Cooling System, Checking for Leaks

⇒ [“1.11.1 Pressure Checking”, page 195](#)

⇒ [“1.11.2 Pressure Relief Valve in Cap, Checking”, page 197](#) .

### 1.11.1 Pressure Checking

Special tools and workshop equipment required



- ◆ Cooling System Tester - VAG1274B-
- ◆ Cooling System Tester - Adapter - VAG1274/8-
- ◆ Cooling System Tester - Adapter - VAG1274/9-

#### Test Conditions

- Engine at operating temperature

#### Test Sequence



##### DANGER!

**Risk of scalding due to hot steam and hot coolant:**

- ◆ *The cooling system is under pressure when the engine is warm.*
- ◆ *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- ◆ *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*

- Open the cap on the coolant expansion tank.
- Install the -VAG1274/8- in the coolant expansion tank.
- Clamp the -VAG1274B/1- in the -VAG1274/8- .
- Connect the -VAG1274B/1- to the -VAG1274B- using the connecting hose provided.
- Generate approximately 1 bar (14.5 psi) pressure using the cooling system tester hand pump.



##### DANGER!

**Risk of scalding due to hot steam and hot coolant:**

- ◆ *The existing pressure must be reduced before disconnecting the -VAG1274B- from the connecting hose or the -VAG1274B/1- .*
- ◆ *To do this, press the pressure release valve on the -VAG1274B- until the pressure gauge displays the value »0«.*

If the pressure drops:

- Look for leaks and correct.



## 1.11.2 Pressure Relief Valve in Cap, Checking



### DANGER!

*Risk of scalding due to hot steam and hot coolant:*

- ◆ *The cooling system is under pressure when the engine is warm.*
- ◆ *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- ◆ *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*

- Open the cap on the coolant expansion tank.
- Install the cap in the -VAG1274/9- .
- Clamp the -VAG1274B/1- in the -VAG1274/9- .
- Connect the -VAG1274B/1- to the -VAG1274B- using the connecting hose provided.
- Generate a maximum pressure of 1.6 bar (23.2 psi) using the hand pump on the -VAG1274B- .
- Pressure relief valve must not open yet.

If pressure relief valve opens prematurely:

- Replace the cap.
- Increase the pressure to above 1.6 bar (23.2 psi).
- Pressure relief valve must open.

If the pressure relief valve does not open:

- Replace the cap.

## 1.12 Oil Cooler, Checking for Leaks

**Special tools and workshop equipment required**

- ◆ Refractometer - T10007A-
- ◆ Hose Clamps - Up To 25 mm - 3094-
- ◆ Cooling System Tester - VAG1274B-
- ◆ Cooling System Tester - Adapter - VAG1274/8-
- ◆ Hose Clip Pliers - VAS6362-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Expansion Tank - 1K0 121 407 A or 6Q0 121 407 A or 1J0 121 407 B-
- ◆ Plug - 191 211 343-
- ◆ Closure Cap - 1J0 121 324-
- ◆ Coolant Hose - 251 265 056-

**Test Conditions**

- Engine must be cold.



## Test Sequence

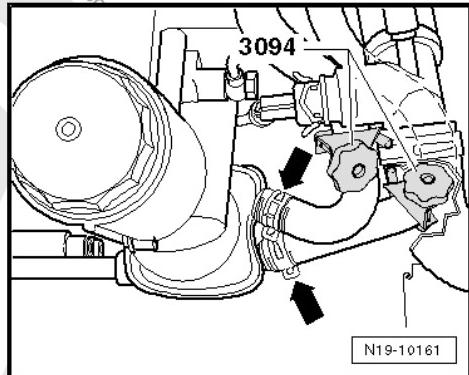
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
- Clamp off the coolant hoses from the oil cooler using - 3094- .
- Loosen the spring clamps -arrows- using the -VAS6362- .



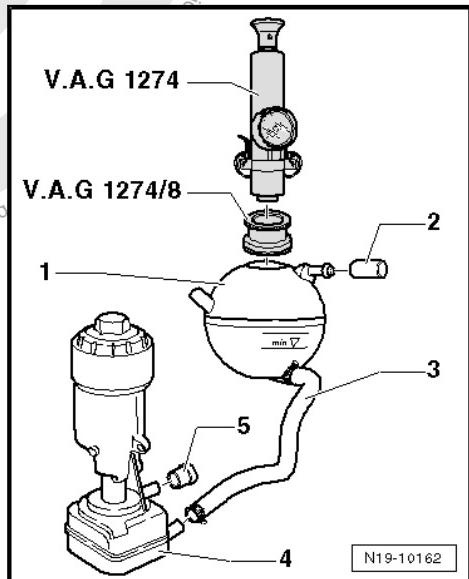
### Note

Catch leaking coolant with the -VAS6208- .

- Disconnect the coolant hoses from the oil cooler.
- Mount the Closure Cap -5- on the rear connection on the oil cooler -4- .
- Attach the Plug -2- to the coolant expansion tank vent connection -1- .
- Secure the coolant hose -3- on the oil cooler and on the coolant expansion tank.



N19-10161

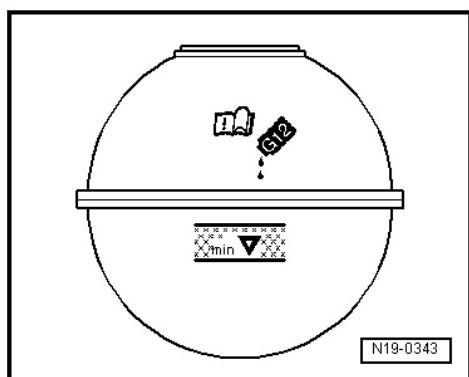


N19-10162

- Slowly fill the coolant up to the upper marking in the hatched area on the expansion tank.
- Position the -VAG1274B- with the -VAG1274/8- on the coolant expansion tank.
- Generate a pressure of approximately 1.6 bar (23.2 psi) using the hand pump on the -VAG1274/8- .
- Watch the pressure decrease on the pressure gauge.
- The pressure must not fall within 10 minutes.

If the pressure drops:

- Replace the oil cooler. Refer to ⇒ [“4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 164](#) , Overview - Oil Filter Bracket and Oil Cooler



N19-0343

Install in reverse order of removal. Note the following:

- Check the coolant level and fill if necessary. Refer to ⇒ [“1.10 Coolant, Draining and Filling”, page 192](#) .



## 1.13 Engine Preheater

- ⇒ [“1.13.1 Overview - Engine Preheater”, page 199 .](#)
- ⇒ [“1.13.2 Engine Preheater, Removing and Installing”, page 200 .](#)

### 1.13.1 Overview - Engine Preheater

#### 1 - Coolant Pipe for Engine Preheater

- Secured in the upper area on the bracket for the wiring harness and coolant pipe -Item 13- ⇒ [Item 13 \(page 199\)](#)
- Secured in the lower area on the charge air pipe with the engine preheater bracket

-Item 15- ⇒ [Item 15 \(page 266\)](#)

#### 2 - Coolant Hose from the Cylinder Block Connection to the Transmission Fluid Cooler

#### 3 - Coolant Hose from the Transmission Fluid Cooler to the Engine Oil Cooler

#### 4 - Coolant Hose from the Engine Preheater Coolant Pipe to the Engine Preheater

#### 5 - Locking Mechanism

#### 6 - External Power Supply Connecting Cable

#### 7 - Left Air Grille

- Air Grille, Removing and installing. Refer to ⇒ [Body Exterior; Rep. Gr. 63 ; Front Bumper Cover; Front Bumper Cover Attachments .](#)

#### 8 - Bracket

#### 9 - Engine Preheater

- Removing and installing. Refer to ⇒ [“1.13.2 Engine Preheater, Removing and Installing”, page 200 .](#)

#### 10 - Engine Preheater Clamp

- Secured on the bracket

#### 11 - Bolt

- 10 Nm

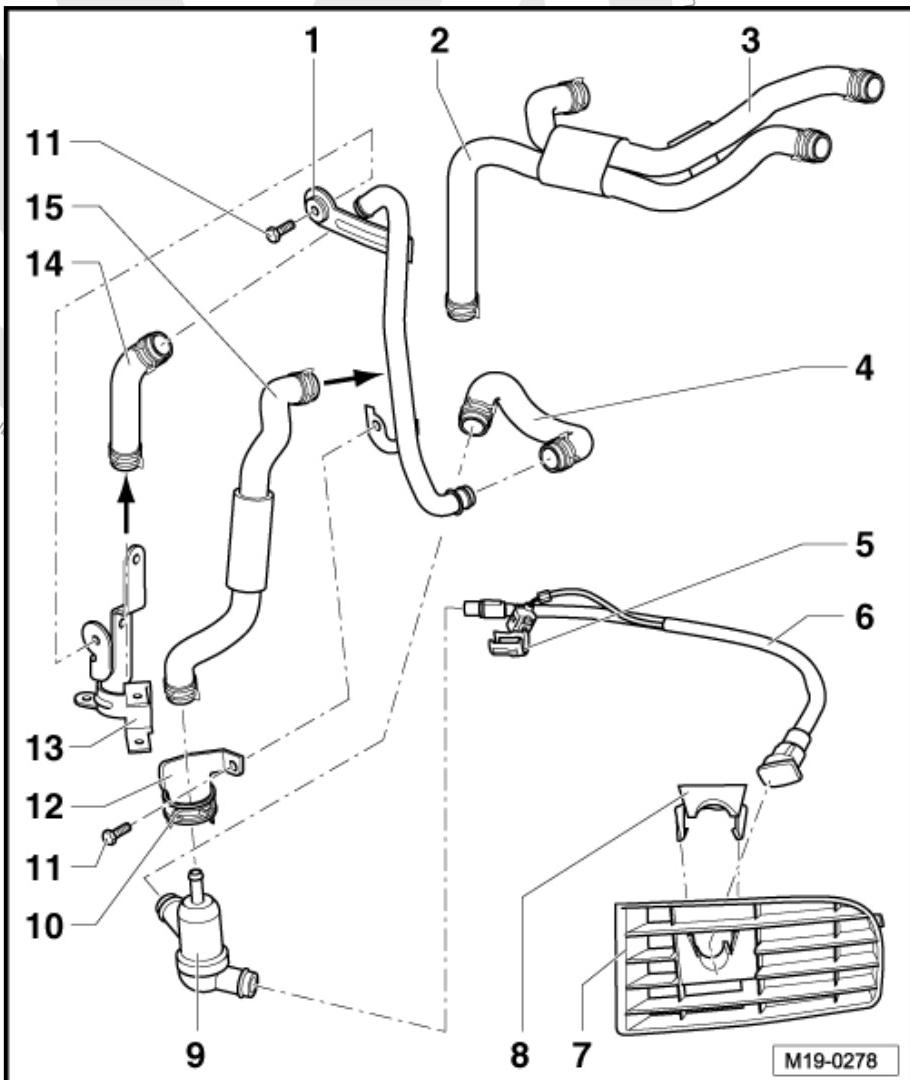
#### 12 - Engine Preheater Bracket

#### 13 - Bracket for Wiring Harness and Coolant Pipe

- Secured on the oil filter bracket -Item 16- ⇒ [Item 16 \(page 166\)](#)

#### 14 - Coolant Hose from the Engine Oil Cooler to the Engine Preheater Coolant Pipe

#### 15 - Coolant Hose from the Engine Preheater to the Coolant Hose on the Cylinder Block





## 1.13.2 Engine Preheater, Removing and Installing

### Special tools and workshop equipment required

- ◆ Refractometer - T10007A-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Hose Clip Pliers - VAS6362-

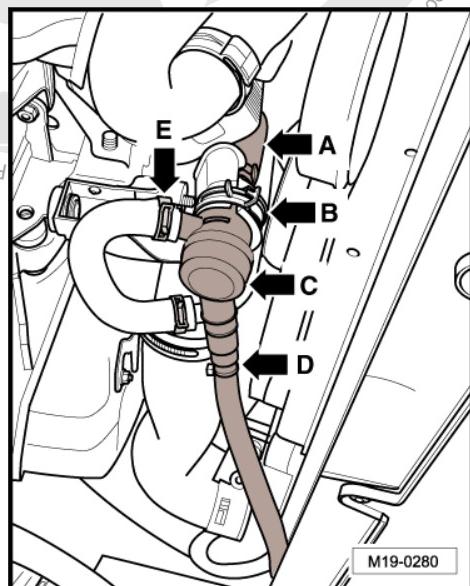
### Removing:

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
- Drain the coolant. Refer to [⇒ “1.10 Coolant, Draining and Filling”, page 192](#) .
- Loosen the coolant hose clamp and remove the coolant hose from the connection -arrow A-.
- Unclip the retainer and disconnect the Engine Preheater connector -arrow D-.
- Loosen the coolant hose clamp and remove the coolant hose from the connection -arrow E-.
- Release the clamp -arrow B- and remove the Engine Preheater -arrow C- downward.

### Installing:

Install in reverse order of removal.

- Fill with coolant. Refer to [⇒ “1.10 Coolant, Draining and Filling”, page 192](#) .
- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .





## 20 – Fuel Supply

### 1 Safety Precautions when Working on Fuel Supply System



#### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations.*
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*
- ◆ *The fuel or fuel lines in fuel system can become very hot (danger of scalding)!*
- ◆ *In addition, the fuel system is under pressure! Before opening the system, place rags around the connection area and release pressure by carefully loosening the connection!*
- ◆ *Always wear protective eyewear, safety gloves and protective clothing when performing any work on the fuel system to avoid eye injuries and burns.*
- ◆ *If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to ⇒ “3.10 Fuel System, Filling/Bleeding”, page 304 . (Running the high pressure fuel pump when dry must always be avoided).*

**Always Pay Attention to the following When Removing and Installing the Fuel Level Sensor - G- or the Fuel Pump - G23- (Fuel Delivery Unit) From Full or Partially Filled Fuel Tanks.**

- ◆ Before starting work, switch the exhaust extraction system on and place an extraction hose close to the fuel tank installation opening to extract fuel fumes. If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a delivery volume greater than 15 m<sup>3</sup>/h can be used.
- ◆ Do not let fuel come in contact with skin. Wear fuel-resistant gloves.



## 2 Guidelines for Clean Working Conditions

**When Working on the Fuel Supply/Injection System, Pay Careful Attention to the following "7 rules" of Cleanliness:**

- ◆ Thoroughly clean the connection points and the surrounding area before loosening.
- ◆ Place the removed parts on a clean surface and cover them. Only use lint-free cloths.
- ◆ Carefully cover or seal opened components if the repair is not performed immediately.
- ◆ Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use parts that have been loosely stored or unpackaged (for example, in tool boxes etc.).
- ◆ Supplied transport and protective packaging and sealing cover should only be removed immediately before installing.
- ◆ When the fuel system is open: avoid working with compressed air if possible. Do not move the vehicle if possible.
- ◆ In addition, do not let diesel fuel flow onto the coolant hoses. If necessary, the hoses must be cleaned again immediately. Replace corroded hoses.





### 3 Misfueling

⇒ “3.1 Start Here”, page 203

⇒ “3.2 Step 1 (Engine Was Started with Incorrect Fuel)”, page 203

⇒ “3.3 Step 2 (Engine Was Not Started with Incorrect Fuel)”, page 204

⇒ “3.4 Step 3 (Shavings in the Fuel Delivery Unit and Reservoir)”, page 205

⇒ “3.5 Step 4 (No Shavings in the Fuel Delivery Unit and Reservoir)”, page 206

⇒ “3.6 Step 5 (Shavings in the High Pressure Pump)”, page 206

⇒ “3.7 Step 6 (No Shavings in the High Pressure Pump)”, page 207

#### 3.1 Start Here



##### Caution

*Fueling incorrectly can cause insufficient lubrication which can lead to irreversible damage to the high pressure components, especially the high pressure pump. Damage caused by seizing and particle abrasion should be expected. These particles will cause further damage in the pressure control valve and the injectors.*



##### Note

- ◆ This information guides the reader through the individual procedures like a flowchart.
- ◆ The connector couplings must »audibly« engage when locking.
- ◆ Note the color coding when installing the connector coupling. Refer to ⇒ page 223 !
- ◆ Pull on the connector coupling to check for secure fit.
- ◆ Disconnect the connector couplings. Refer to ⇒ “5 Connector Couplings, Disconnecting”, page 223 .

#### Was the Engine Started with the Incorrect Fuel?

Yes. Refer to ⇒ “3.2 Step 1 (Engine Was Started with Incorrect Fuel)”, page 203 .

No. Refer to ⇒ “3.3 Step 2 (Engine Was Not Started with Incorrect Fuel)”, page 204 .

#### 3.2 Step 1 (Engine Was Started with Incorrect Fuel)

- Empty the fuel tank as much as possible through the filler neck using the -VAS5190-. Refer to ⇒ “4.4 Fuel Tank, Draining”, page 213 .
- Remove the rear bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .



- Remove the flange cover.



**Note**

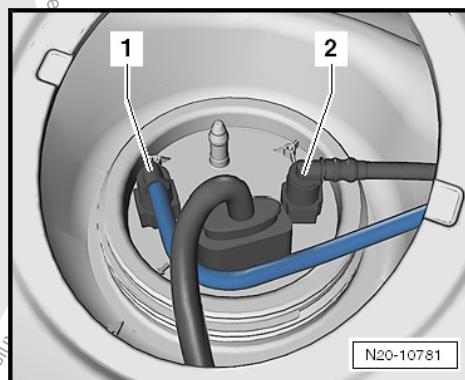
*Press the locking ring to release the fuel line.*



**WARNING**

*If the battery is connected, make sure that the fuel pump is not activated when the door is opened. Fuel may leak out when the system is open.*

- Remove the fuel return line, which is blue or has a blue marking, -1- from the fuel delivery unit. Disconnect the coupling. Refer to [⇒ “5 Connector Couplings, Disconnecting”, page 223](#).
- Connect the -VAS6551/5-2- to the fuel return line -1-. Guide the free end of the Diesel Pressure Tester Kit - Adapter Set - Connection Hose 2 - VAS6551/5-2- into a suitable container.
  - Connect the Vehicle Diagnostic Tester and perform the Guided Function “Activate Fuel Pump (evacuate the fuel system)”.



**Note**

*The fuel pump is now activated.*

- Repeat this procedure as necessary until the fuel tank is completely empty.

**Remove the Fuel Delivery Unit. Refer to [⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 219](#).**

- Check the fuel tank for shavings.
- Empty the fuel delivery unit reservoir.
- Check the reservoir visually for large contaminants and shavings and on the screen.

**Are There Any Shavings?**

Yes. Refer to [⇒ “3.4 Step 3 \(Shavings in the Fuel Delivery Unit and Reservoir\)”, page 205](#).

No. Refer to [⇒ “3.5 Step 4 \(No Shavings in the Fuel Delivery Unit and Reservoir\)”, page 206](#).

### 3.3 Step 2 (Engine Was Not Started with Incorrect Fuel)

- Empty the fuel tank as much as possible through the filler neck using the -VAS5190-. Refer to [⇒ “4.4 Fuel Tank, Draining”, page 213](#).
- Remove the rear bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .
- Fold the carpet to the side or forward if necessary.
- Remove the flange cover.



Press the locking ring to release the fuel line.



### WARNING

If the battery is connected, make sure that the fuel pump is not activated when the door is opened. Fuel may leak out when the system is open.

- Remove the fuel return line, which is blue or has a blue marking, -1- from the fuel delivery unit. Disconnect the coupling. Refer to [⇒ "5 Connector Couplings, Disconnecting", page 223](#).
- Connect the -VAS6551/5-2- to the fuel return line -1-.
- Guide the free end of the -VAS6551/5-2- into a suitable container.
- Connect the Vehicle Diagnostic Tester and perform the Guided Function "Activate Fuel Pump".

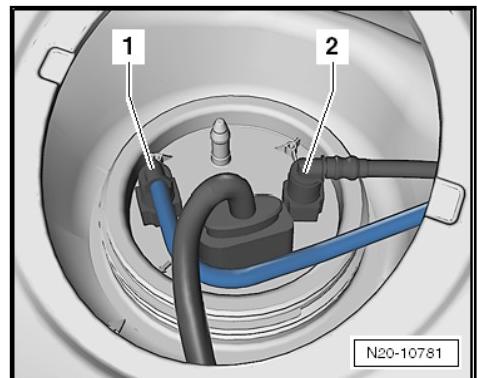


### Note

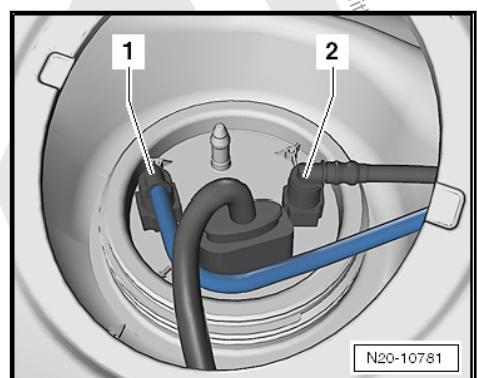
The fuel pump is now activated.

- Repeat this procedure as necessary until the fuel tank is completely empty.
- Fill the fuel tank with five liters (5.28 quarts) of diesel fuel.
- Drain the fuel tank again completely as described above.
- Reconnect the fuel return line (blue, or blue marking) -1-.
- Replace the fuel filter. Refer to [⇒ Maintenance ; Booklet 20.1](#).
- Fuel the vehicle and perform a road test.

End



N20-10781



N20-10781

## 3.4 Step 3 (Shavings in the Fuel Delivery Unit and Reservoir)

- Clean the fuel delivery unit and the fuel tank with the - VAS5226- .
- Install the fuel delivery unit. Refer to [⇒ "4.6 Fuel Delivery Unit, Removing and Installing", page 219](#) .
- Fill the fuel tank with five liters (5.28 quarts) of diesel fuel.
- Drain the fuel tank again completely as described above.
- Replace the following high pressure components:





- ◆ High pressure pump. Refer to ["3.9 High Pressure Fuel Pump, Removing and Installing", page 301](#).
- ◆ High pressure lines. Refer to ["3.5.2 High Pressure Lines, Installing", page 295](#).
- ◆ High pressure reservoir (Rail) including Fuel Pressure Regulator Valve - N276- and Fuel Pressure Sensor - G247-. Refer to ["3.2 Overview - Fuel System", page 281](#).
- ◆ Injector. Refer to ["3.5 Fuel Injector \(Piezo Injector\), Removing and Installing and High Pressure Lines, Installing", page 292](#).
- ◆ Fuel return lines (oil overflow lines). Refer to ["3.3 Overview - Fuel System", page 285](#).
- ◆ Replace the fuel filter. Refer to ["6.3 Fuel Filter, Removing and Installing", page 229](#).

Fuel the vehicle.

- Bleed the fuel system. Refer to ["3.10 Fuel System, Filling/Bleeding", page 304](#).
- Perform a road test.

End

### 3.5 Step 4 (No Shavings in the Fuel Delivery Unit and Reservoir)

Fill the fuel tank with five liters (5.28 quarts) of diesel fuel.

- Drain the fuel tank again completely as described above.



#### Caution

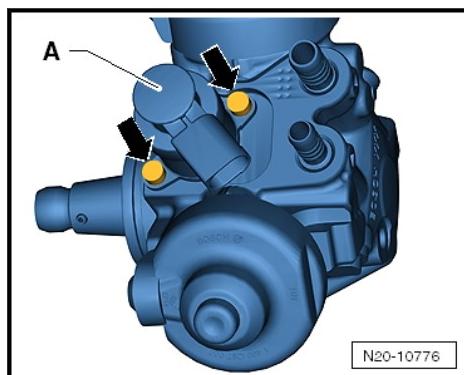
*Removing the Fuel Metering Valve - N290- increases the risk that the high pressure pump will be damaged from the outside by debris. For this reason, always ensure the utmost cleanliness.*

- Carefully clean the high pressure pump near the Fuel Metering Valve - N290- .
- Disconnect from the valve.
- Remove the bolts -arrows- and carefully remove the Fuel Metering Valve - N290- .
- Inspect the Fuel Metering Valve - N290- and the high pressure pump for shavings.

#### Are There Any Shavings?

Yes. Refer to ["3.6 Step 5 \(Shavings in the High Pressure Pump\)", page 206](#).

No. Refer to ["3.7 Step 6 \(No Shavings in the High Pressure Pump\)", page 207](#).



N20-10776

### 3.6 Step 5 (Shavings in the High Pressure Pump)

- Replace the following high pressure components:
- ◆ High pressure pump. Refer to ["3.9 High Pressure Fuel Pump, Removing and Installing", page 301](#).



- ◆ High pressure lines. Refer to [“3.5.2 High Pressure Lines, Installing”, page 295](#).
- ◆ High pressure reservoir (Rail) including Fuel Pressure Regulator Valve - N276- and Fuel Pressure Sensor - G247-. Refer to [“3.2 Overview - Fuel System”, page 281](#)
- ◆ Injector. Refer to [“3.5 Fuel Injector \(Piezo Injector\), Removing and Installing and High Pressure Lines, Installing”, page 292](#)
- ◆ Fuel return lines (oil overflow lines). Refer to [“3.3 Overview - Fuel System”, page 285](#).
- ◆ Replace the fuel filter. Refer to [“6.3 Fuel Filter, Removing and Installing”, page 229](#).

- Fuel the vehicle.
- Bleed the fuel system. Refer to [“3.10 Fuel System, Filling/Bleeding”, page 304](#).
- Perform a road test.

End

### 3.7 Step 6 (No Shavings in the High Pressure Pump)

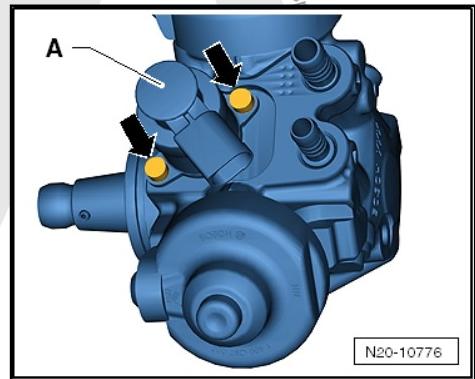


#### Caution

*Make sure that the seals for the Fuel Metering Valve - N290- are not damaged. The high pressure pump must be replaced if the seal is damaged.*

- Coat the lower seal for the Fuel Metering Valve - N290- with fuel.
- Slide the valve into the high pressure pump by lightly twisting it.
- Install both bolts -arrows- by hand.
- First tighten the bolts to 3 Nm and then tighten them to 7 Nm.
- Replace the fuel filter. Refer to [Maintenance ; Booklet 20.1](#).
- Bleed the fuel system. Refer to [“3.10 Fuel System, Filling/Bleeding”, page 304](#).
- Fuel the vehicle and perform a road test.

End





## 4 Fuel Supply System Components

- ⇒ [“1 Safety Precautions when Working on Fuel Supply System”, page 201](#)
- ⇒ [“2 Guidelines for Clean Working Conditions”, page 202](#)
- ⇒ [“4.1 General Information”, page 208](#)
- ⇒ [“4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011”, page 209](#)
- ⇒ [“4.3 Overview - Fuel Tank, Jetta from MY 2011 Only”, page 211](#)
- ⇒ [“4.4 Fuel Tank, Draining”, page 213](#)
- ⇒ [“4.5 Fuel Tank, Removing and Installing”, page 216](#)
- ⇒ [“4.6 Fuel Delivery Unit, Removing and Installing”, page 219](#)
- ⇒ [“4.7 Fuel Level Sensor G, Removing and Installing”, page 221](#)

### 4.1 General Information

Special tools and workshop equipment required

- ◆ Hose Clip Pliers - VAS6362-



#### Note

- ◆ Hose connections are secured with either spring or hose clamps.
- ◆ Always replace hose clamps with spring clamps. Refer to Parts Catalog.
- ◆ -VAS6362- or the -VAS6340- are recommended for installing spring clips.



#### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to ⇒ [“1 Safety Precautions when Working on Fuel Supply System”, page 201](#)
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ [“2 Guidelines for Clean Working Conditions”, page 202](#).

Always pay attention to these instructions before and during work.



## 4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011



### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to → ["1 Safety Precautions when Working on Fuel Supply System", page 201](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to → ["2 Guidelines for Clean Working Conditions", page 202](#).

Always pay attention to these instructions before and during work.





**1 - Cap**

- Replace if damaged

**2 - Bolt**

- 1.5 Nm

**3 - Ground Connection**

- Check for secure fit

**4 - Bolt**

- 11 Nm

**5 - Bracket**

- For the ABS speed sensor wire

**6 - Fuel Tank**

- Draining. Refer to ["4.4 Fuel Tank, Draining", page 213](#).
- Removing and installing. Refer to ["4.5 Fuel Tank, Removing and Installing", page 216](#).
- Support while removing with the Engine and Gearbox Jack - VAS6931-.

**7 - Bolt**

- 25 Nm
- Always replace

**8 - Heat Shield**

**9 - Lock Washer**

**10 - Mounting Strap**

- Note the installation position

**11 - Mount**

- For the front muffler of the exhaust system -Item 2- [Item 2 \(page 360\)](#)

**12 - Seal**

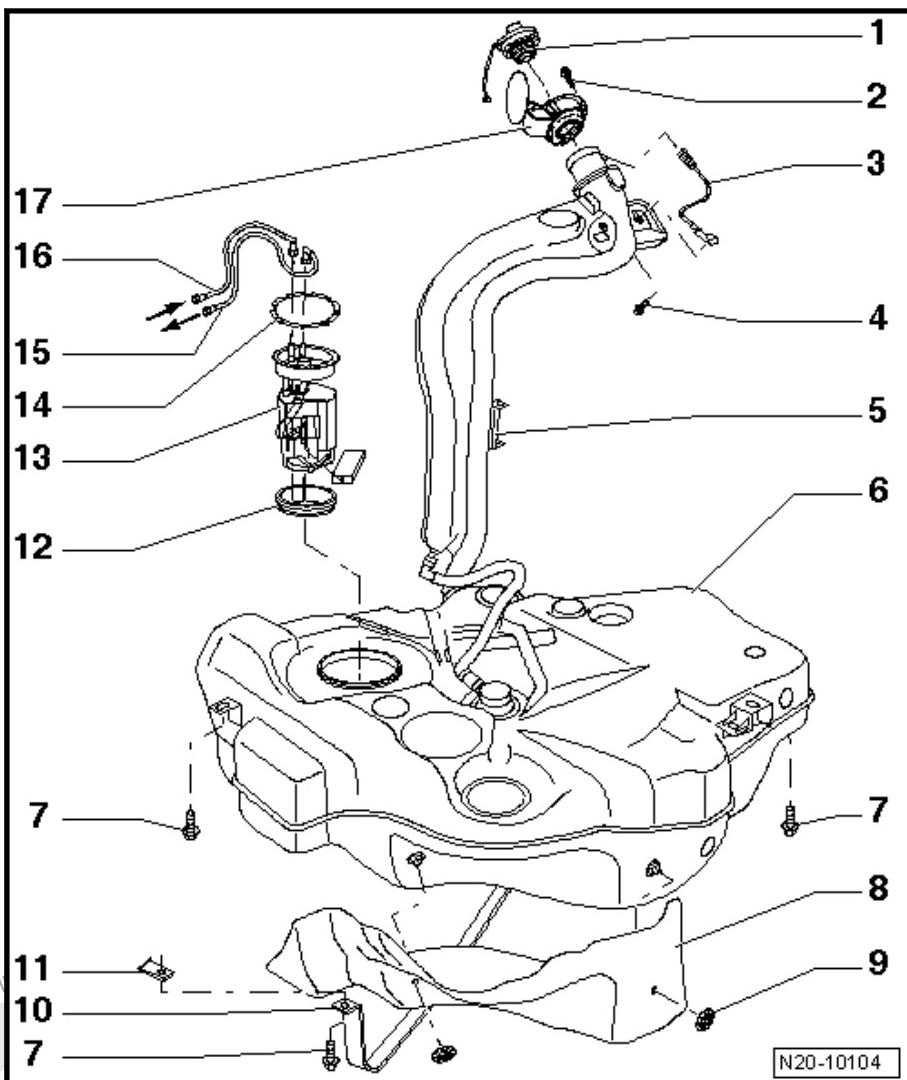
- Replace if damaged
- Insert dry into the fuel tank opening
- Coat with fuel only when installing the flange

**13 - Fuel Delivery Unit**

- Note the installation position of the fuel delivery unit flange. Refer to ["Fuel Delivery Unit Flange Installation Position", page 211](#)
- Fuel Delivery Unit, Removing and installing. Refer to ["4.6 Fuel Delivery Unit, Removing and Installing", page 219](#).
- With the Fuel Level Sensor - G-
- Fuel Level Sensor - G-, Removing and installing. Refer to ["4.7 Fuel Level Sensor G , Removing and Installing", page 221](#).
- With the Transfer Fuel Pump - G6-
- Transfer Fuel Pump - G6- , Checking. Refer to ["6.4 Transfer Fuel Pump G6 , Checking", page 229](#).

**14 - Locking Ring**

- 110 Nm
- Check for secure fit





- Remove and install with the Wrench - Fuel Sending Unit - T10202- .

#### 15 - Fuel Supply Line

- Black
- Attached to the side of the fuel tank
- Check for secure fit
- To disconnect, press the release button on the connecting piece
- To fuel filter -Item 1- [Item 1 \(page 228\)](#)

#### 16 - Fuel Return Line

- Blue
- Attached to the side of the fuel tank
- Check for secure fit
- To disconnect, press the release button on the connecting piece
- From fuel filter -Item 3- [Item 3 \(page 228\)](#)

#### 17 - Fuel Filler Door Unit

- With rubber gasket
- Removing and installing. Refer to [⇒ Body Exterior; Rep. Gr. 55 ; Fuel Filler Door Unit; Fuel Filler Door Unit, Removing and Installing](#) .

#### Fuel Delivery Unit Flange Installation Position

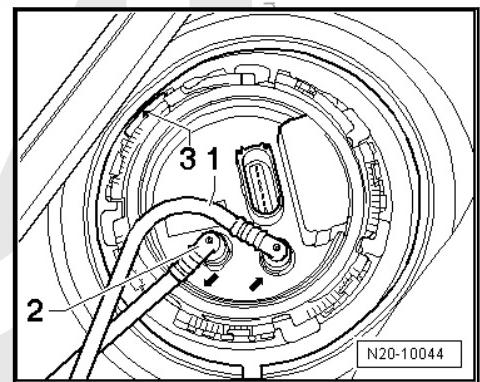
The mark -3- on the flange points opposite the direction of travel.

- 1 - Fuel Return Line (Blue)
- 2 - Fuel Supply Line (Black)
- 3 - Marking



##### Note

- ◆ The fuel delivery unit flange can only be installed in this position.
- ◆ Make sure the supply and return lines are still clipped to the fuel tank after the fuel delivery unit flange has been installed.



#### 4.3 Overview - Fuel Tank, Jetta from MY 2011 Only



##### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to [⇒ "1 Safety Precautions when Working on Fuel Supply System", page 201](#) .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to [⇒ "2 Guidelines for Clean Working Conditions", page 202](#) .

Always pay attention to these instructions before and during work.



**1 - Cap**

- Replace if damaged

**2 - Bolt**

- 1.5 Nm

**3 - Ground Connection**

- Check for secure fit

**4 - Bolt**

- 11 Nm

**5 - Rivet**

**6 - Protective Plate**

- Riveted to lower clamp at factory
- When replacing fuel tank, set protective plate on filler tube and rivet clamp (holes on protective plate must coincide with holes on filler tube).

**7 - Cable Guide**

- For the ABS line
- Clipped to the shield

**8 - Bolt**

- 25 Nm
- Always replace

**9 - Fuel Tank**

- Draining. Refer to ["4.4 Fuel Tank, Draining", page 213](#).
- Removing and installing. Refer to ["4.5 Fuel Tank, Removing and Installing", page 216](#).
- Support while removing with the Engine and Gearbox Jack - VAS6931- .

**10 - Lock Washer**

**11 - Heat Shield**

**12 - Mounting Strap**

- Note the installation position

**13 - Mount**

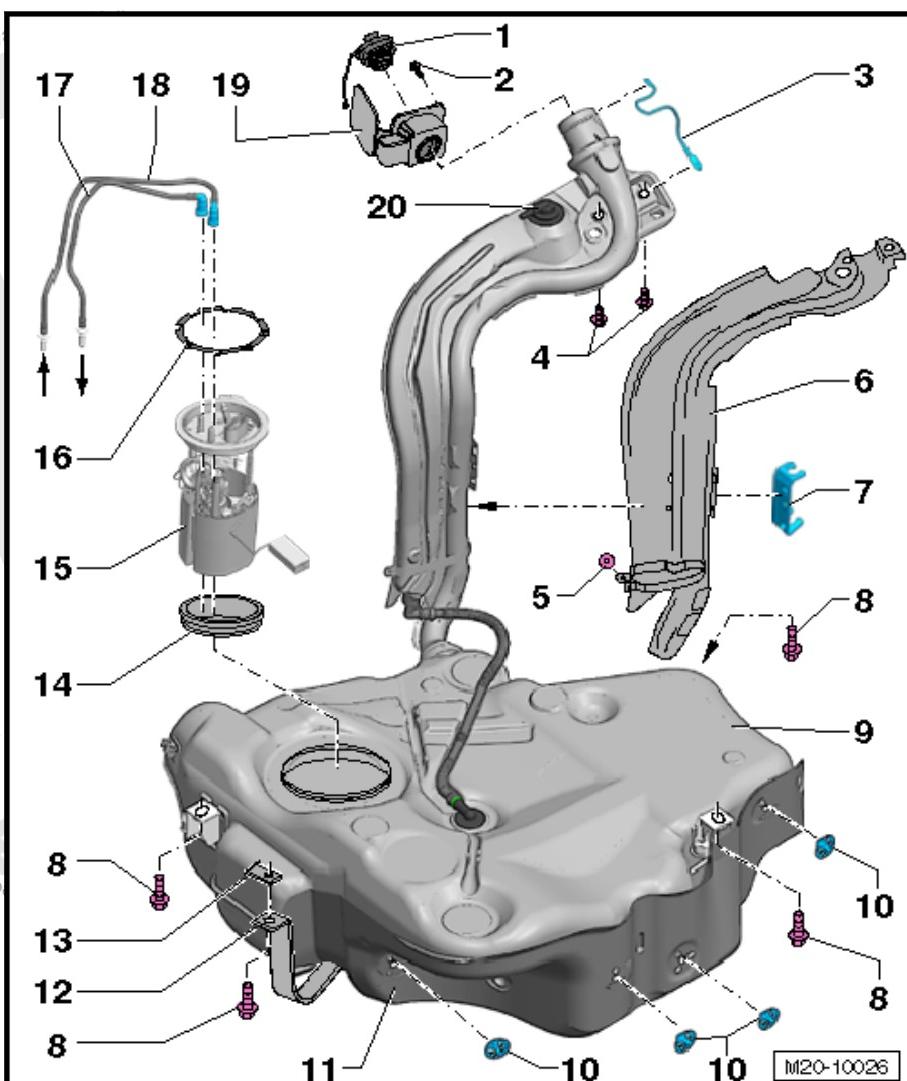
- For the exhaust system -Item 2- [Item 2 \(page 362\)](#)

**14 - Seal**

- Replace if damaged
- Insert dry into the fuel tank opening
- Coat with fuel only when installing the flange

**15 - Fuel Delivery Unit**

- Note the installation position of the fuel delivery unit flange. Refer to ["Fuel Delivery Unit Flange Installation Position", page 213](#)
- Fuel Delivery Unit, Removing and installing. Refer to ["4.6 Fuel Delivery Unit, Removing and Installing", page 219](#).
- With the Fuel Level Sensor - G-
- Fuel Level Sensor - G-, Removing and installing. Refer to ["4.7 Fuel Level Sensor G , Removing and Installing", page 221](#) .





- With the Transfer Fuel Pump - G6-
- Transfer Fuel Pump - G6- , Checking. Refer to ["6.4 Transfer Fuel Pump G6 , Checking", page 229](#) .

#### 16 - Locking Ring

- 110 Nm
- Check for secure fit
- Remove and install with the Wrench - Fuel Sending Unit - T10202- .

#### 17 - Fuel Supply Line

- Black
- Attached to the side of the fuel tank
- Check for secure fit
- To disconnect, press the release button on the connecting piece
- To fuel filter -Item 1- [Item 1 \(page 228\)](#)

#### 18 - Fuel Return Line

- Blue
- Attached to the side of the fuel tank
- Check for secure fit
- To disconnect, press the release button on the connecting piece
- From fuel filter -Item 3- [Item 3 \(page 228\)](#)

#### 19 - Fuel Filler Door Unit

- With rubber gasket
- Removing and installing. Refer to [Body Exterior; Rep. Gr. 55 ; Fuel Filler Door Unit; Fuel Filler Door Unit, Removing and Installing](#) .

#### 20 - Ventilation

#### Fuel Delivery Unit Flange Installation Position

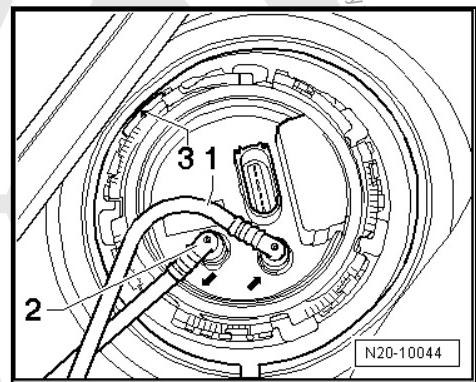
The mark -3- on the flange points opposite the direction of travel.

- 1 - Fuel Return Line (Blue)
- 2 - Fuel Supply Line (Black)
- 3 - Marking



##### Note

- ◆ The fuel delivery unit flange can only be installed in this position.
- ◆ Make sure the supply and return lines are still clipped to the fuel tank after the fuel delivery unit flange has been installed.



## 4.4 Fuel Tank, Draining

[⇒ "4.4.1 Fuel Tank, Draining When More than 3/4 Full", page 213](#)

[⇒ "4.4.2 Fuel Tank, Draining When Less Than 3/4 Full", page 215](#) .

### 4.4.1 Fuel Tank, Draining When More than 3/4 Full

#### Special tools and workshop equipment required

- ◆ Wrench - Fuel Sending Unit - T10202-



- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ Fuel Extraction Unit - VAS5190



**DANGER!**

- ◆ *Observe safety precautions when working on fuel supply. Refer to ⇒ "1 Safety Precautions when Working on Fuel Supply System", page 201.*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 202.*

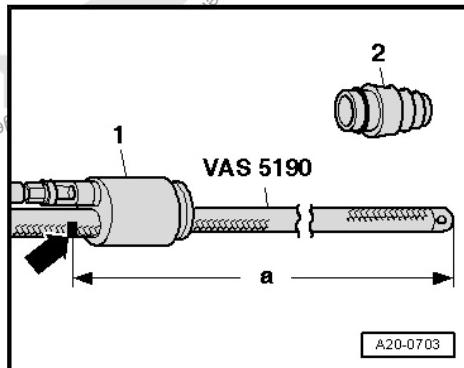
*Always pay attention to these instructions before and during work.*



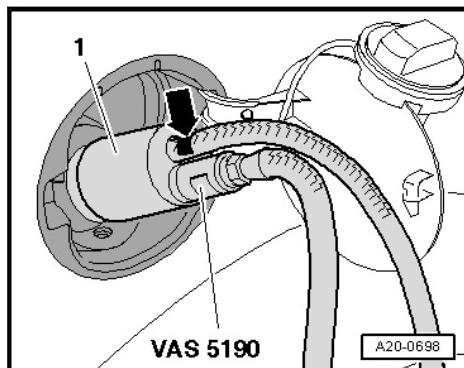
**Caution**

*Secure the -VAS5190- ground wire to a bare area of the chassis.*

- Remove the cone piece -2- from the shaft piece -1- on the -VAS5190- .
- Using insulating tape, apply a mark on the hose -arrow- -a- = 1,180 mm from the end of the suction hose



- Open fuel tank flap and remove fuel tank cap.
- Attach the shaft piece -1- from the -VAS5190- to the fuel tank filler tube.
- Slide the suction hose as far into fuel tank until the mark applied earlier -arrow- stands on shaft piece.





### Note

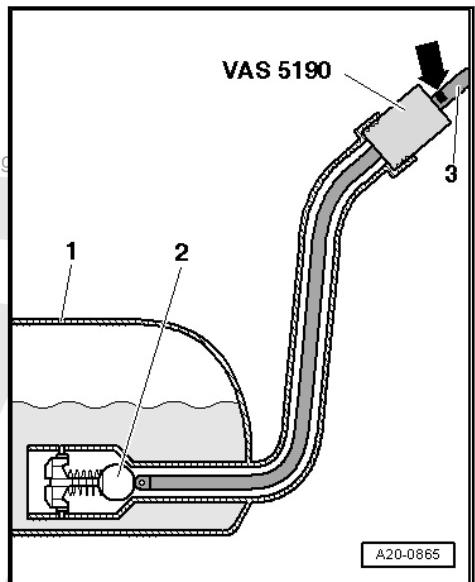
*There is a ball valve -2- located at the lower end of the filler neck in the fuel tank -1- that must not be damaged by the suction hose -3-. Therefore slide in hose only up to the marking -arrow- applied earlier.*

- Empty the fuel tank as much as possible via the filler neck.
- Carefully pull out the suction hose.



### Note

- ◆ When no more fuel can be extracted, the tank is emptied only enough for the fuel delivery unit to be opened without any danger.
- ◆ Fuel tank must be drained completely. Refer to ⇒ ["4.4.2 Fuel Tank, Draining When Less Than 3/4 Full", page 215](#).



## 4.4.2 Fuel Tank, Draining When Less Than 3/4 Full

### Special tools and workshop equipment required

- ◆ Wrench - Fuel Sending Unit -T10202-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ Fuel Extraction Unit - VAS5190 -



### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to ⇒ ["1 Safety Precautions when Working on Fuel Supply System", page 201](#) .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ ["2 Guidelines for Clean Working Conditions", page 202](#) .

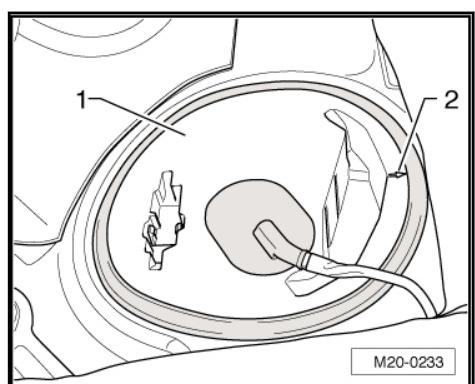
*Always pay attention to these instructions before and during work.*

- Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .
- Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



### DANGER!

- ◆ The fuel supply line is under pressure. Always wear protective eyewear and protective clothing to prevent injuries and contact with skin.
- ◆ Wrap a cloth around the wiring connections before loosening hose connections. Then release pressure by carefully pulling off the line.



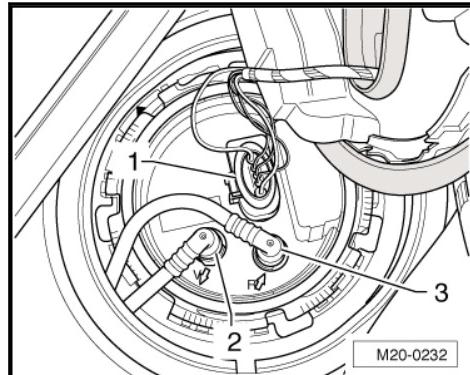


- Disconnect -1-, the black supply line -2- and the blue return line -3-.

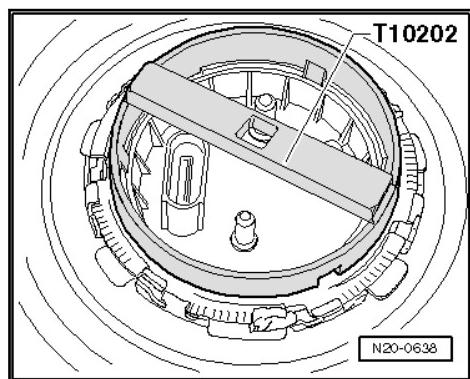


*Press the locking ring to release the fuel lines.*

- Seal the lines so that no dirt can enter the fuel system.
- Open locking ring using -T10202- .
- Slightly lift out the fuel delivery unit flange.
- Insert the suction hose from the -VAS5190- as far as possible into the fuel tank and extract the fuel.



If the fuel tank only needed to be emptied, install the fuel delivery unit again. Refer to ["4.6 Fuel Delivery Unit, Removing and Installing", page 219](#).



## 4.5 Fuel Tank, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Engine and Gearbox Jack - VAS6931-



#### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to ["1 Safety Precautions when Working on Fuel Supply System", page 201](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 202](#).

*Always pay attention to these instructions before and during work.*

### Removing:

#### Conditions

- Fuel tank may be a maximum of  $\frac{1}{4}$  full.



*If necessary, empty the fuel tank using the -VAG5190-. Refer to ["4.4 Fuel Tank, Draining", page 213](#).*



## Procedure

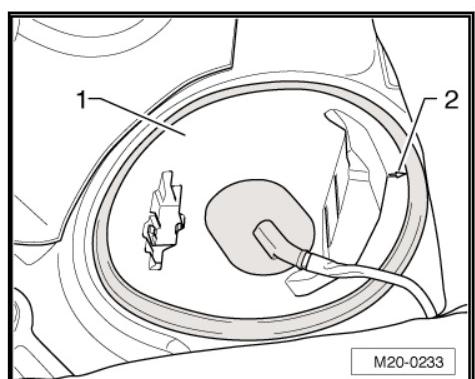
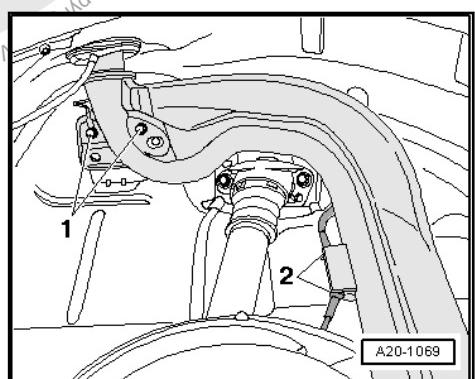
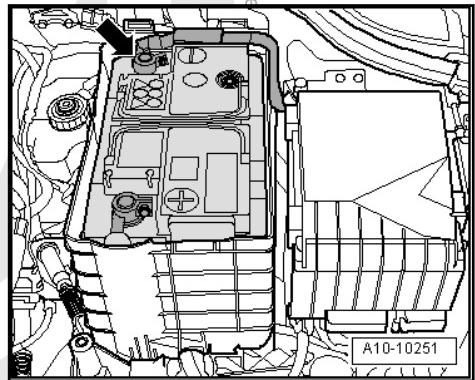


### Caution

*Electronic components could be destroyed when the Battery - A- is disconnected:*

- ◆ Complete the steps for disconnecting the Battery - A- .

- When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .
- Clean the surrounding area around the fuel filler tube.
- Open fuel tank flap and remove fuel tank cap.
- Remove the bolts from the fuel filler door unit and then remove the fuel filler door unit. Refer to ⇒ Body Exterior; Rep. Gr. 55 ; Fuel Filler Door Unit .
- Remove the right rear wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66 Wheel Housing Liner .
- Remove the bolts -1- for the fuel filler neck.
- Disengage the ABS speed sensor wire -2- on the filler neck bracket.
- Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .



- Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



- Disconnect -1- from the fuel delivery unit flange.
- Remove the center muffler and exhaust pipe. Refer to "1.8 Overview - Muffler", page 359 .



Note

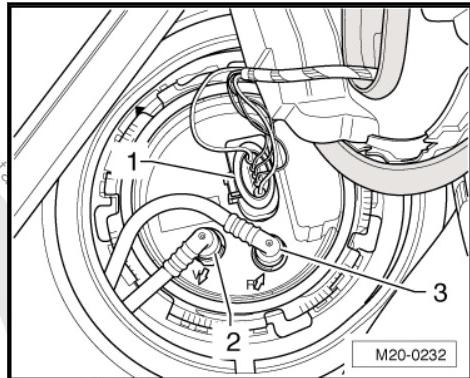
The front and rear muffler may need to be removed beforehand.  
Refer to "1.9 Exhaust System, Disconnecting and Connecting", page 363 .

Continuation for All Vehicles



DANGER!

- ◆ The fuel supply line is under pressure. Always wear protective eyewear and protective clothing to prevent injuries and contact with skin.
- ◆ Wrap a cloth around the wiring connections before loosening hose connections. Then release pressure by carefully pulling off the line.



- Disconnect the black supply line -1- and the blue return line -2- between the fuel tank and the assembly.



Note

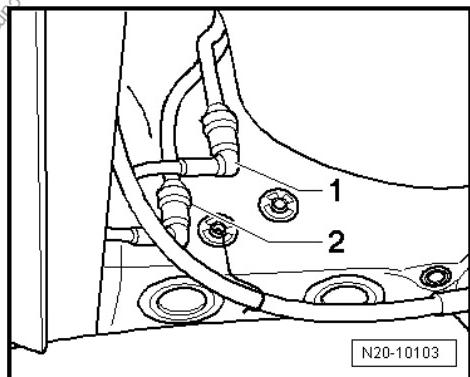
Press the locking ring to release the fuel lines.

- Seal the lines so that no dirt can enter the fuel system.



Note

A second technician is required for the remainder of the procedure to help support the fuel tank.

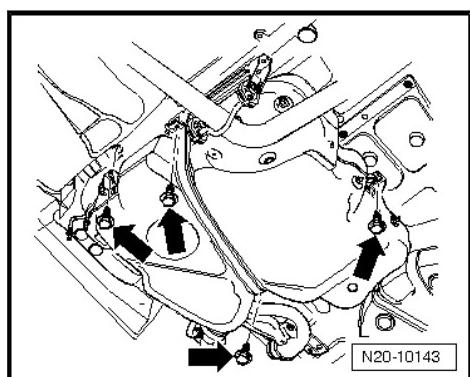


- Remove the mounting strap and bolts -arrows-. Support the fuel tank using the -VAS6931- when doing this.
- Slowly lower fuel tank.



Note

The fuel filler neck must be "guided out" between the body and rear axle. To do so, lift the fuel tank down from the -VAS6931- with the help of a second technician.



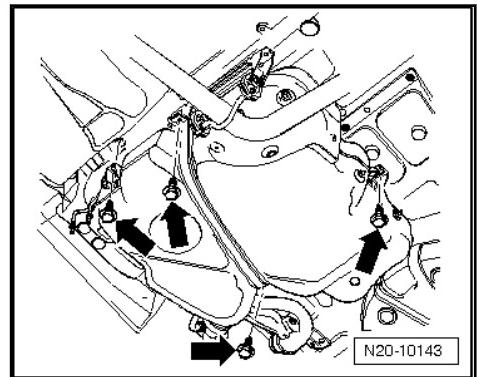
Installing:



- With the help of a second technician, guide the fuel filler neck between rear axle and body. Then place the fuel tank on the -VAS6931- .
- Lift the fuel tank slowly up to the installation position and secure it with new bolts -arrows-.
- Tightening specification -Item 7- [⇒ Item 7 \(page 210\)](#) / -Item 8- [⇒ Item 8 \(page 212\)](#) .

Further installation is the reverse order of removal. Note the following:

- Tightening Specifications: Refer to [⇒ "4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011", page 209](#) , Overview - Fuel Tank - All Vehicles Except Jetta from MY 2011
- Tightening Specifications: Refer to [⇒ "4.3 Overview - Fuel Tank, Jetta from MY 2011 Only", page 211](#) , Overview - Fuel Tank - Jetta from MY 2011 Only
- Route the fuel lines without kinks.
- Do not interchange supply and return line (return line blue, supply line black).
- Make sure the line connections are secure.
- Check the fuel tank/body ground connection on the filler neck for secure fit -Item 3- [⇒ Item 3 \(page 210\)](#) / -Item 3- [⇒ Item 3 \(page 212\)](#) .
- Make sure the fuel lines are still attached to the fuel tank after installing the fuel tank.
- Observe the notes after connecting the Battery - A- . Refer to [⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting](#).



## 4.6 Fuel Delivery Unit, Removing and Installing

**Special tools and workshop equipment required**

- ◆ Wrench - Fuel Sending Unit- T10202-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-



### DANGER!

- ◆ *Observe safety precautions when working on fuel supply. Refer to [⇒ "1 Safety Precautions when Working on Fuel Supply System", page 201](#) .*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to [⇒ "2 Guidelines for Clean Working Conditions", page 202](#) .*

*Always pay attention to these instructions before and during work.*

**Removing:**

**Conditions**

- Fuel tank may be a maximum of  $1/2$  full.





Note

If necessary, empty the fuel tank using the -VAG5190-. Refer to ["4.4 Fuel Tank, Draining", page 213](#).

Procedure

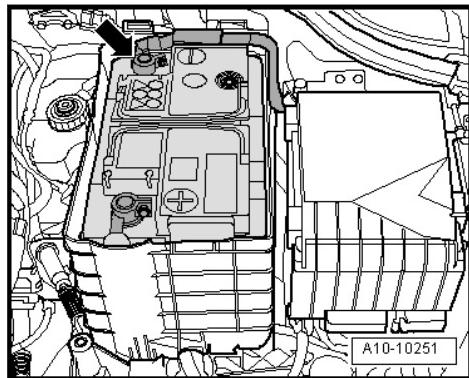


**Caution**

***Electronic components could be destroyed when the Battery - A- is disconnected:***

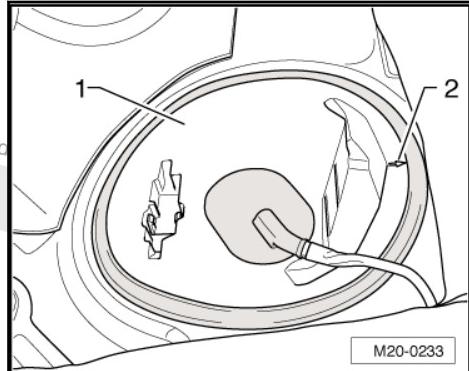
- ◆ Complete the steps for disconnecting the Battery - A- .

- When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to [⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting](#) .
- Remove the bench seat. Refer to [⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing](#) .
- Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



**DANGER!**

- ◆ The fuel supply line is under pressure. Always wear protective eyewear and protective clothing to prevent injuries and contact with skin.
- ◆ Wrap a cloth around the wiring connections before loosening hose connections. Then release pressure by carefully pulling off the line.

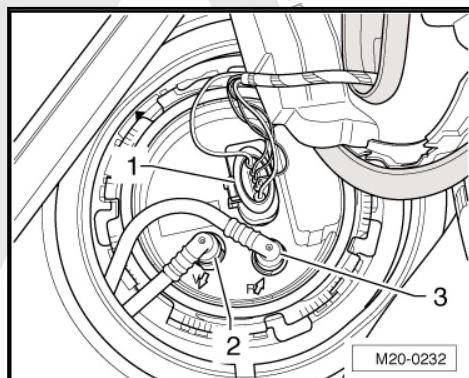


- Disconnect -1-, the black supply line -2- and the blue return line -3-.

Note

Press the locking ring to release the fuel lines.

- Seal the lines so that no dirt can enter the fuel system.



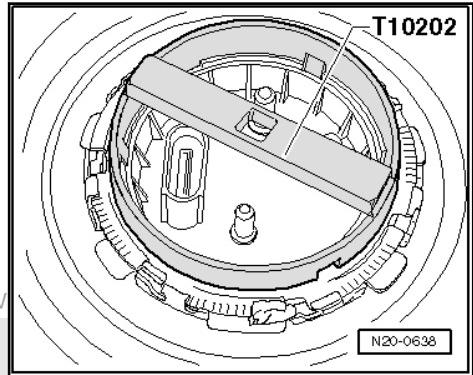


- Open locking ring using -T10202- .
- Pull the fuel delivery unit and gasket out of the fuel tank opening.



**Note**

- ◆ If the fuel delivery unit is to be replaced then drain old delivery unit before disposal.
- ◆ Follow all waste disposal regulations.



**Installing:**

Install in reverse order of removal. Note the following:

- Locking ring tightening specification -Item 14- [⇒ Item 14 \(page 210\)](#) / -Item 16- [⇒ Item 16 \(page 213\)](#) .
- Do not bend the Fuel Level Sensor - G- when inserting the fuel delivery unit.
- Replace the gasket on the fuel delivery unit if damaged and insert it dry into the fuel tank opening.
- Coat the seal with fuel only for installing the fuel delivery unit.
- Note the installation position of the fuel delivery unit flange:
- For the Jetta from MY 2005 through 2010, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 2009 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 2010. Refer to [⇒ Fig. “Fuel Delivery Unit Flange Installation Position”](#), [page 211](#) .
- For Jetta from MY 2011. Refer to [⇒ Fig. “Fuel Delivery Unit Flange Installation Position”](#), [page 213](#) .
- Route the fuel lines without kinks.
- Do not interchange supply and return line (return line blue, supply line black).
- Make sure the line connections are secure.
- Observe the notes after connecting the Battery - A- . Refer to [⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting](#) .

## 4.7 Fuel Level Sensor - G- , Removing and Installing



**DANGER!**

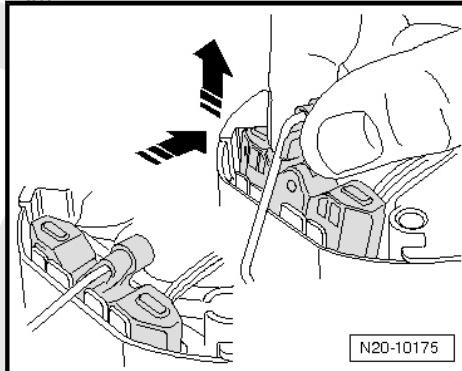
- ◆ Observe safety precautions when working on fuel supply. Refer to [⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 201](#) .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to [⇒ “2 Guidelines for Clean Working Conditions”, page 202](#) .

Always pay attention to these instructions before and during work.

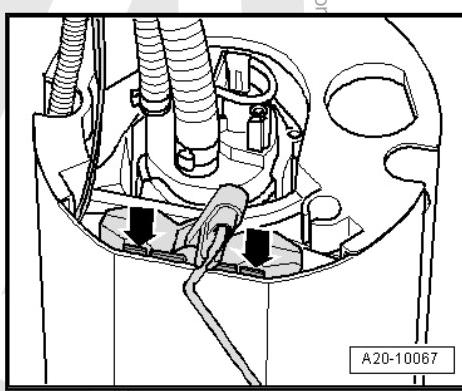


### Removing:

- Remove the fuel delivery unit. Refer to [“4.6 Fuel Delivery Unit, Removing and Installing”, page 219](#).
- Move the Fuel Level Sensor - G- slightly to the side and upward at the same time.



- Push the tabs -arrows- to the side if it is not possible to release the sensor.
- Write down the cable color coding for reinstallation.
- Disconnect the connectors -1 through 3-.

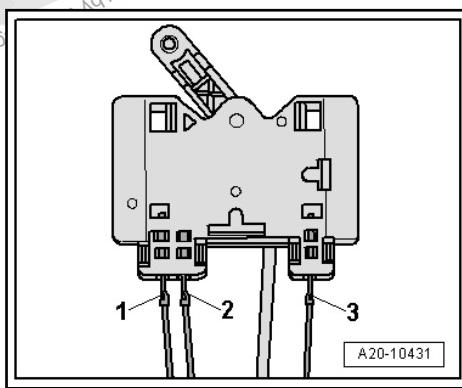


- Bend back the hooks on the connector.

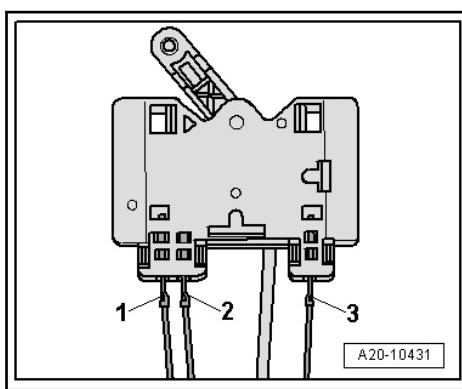
### Installing:

Install in reverse order of removal. Note the following:

- Connect the connectors -1 through 3-.
- Pay attention to the color coding.
- Pull on the connectors to make sure they are secure.
- Insert the Fuel Level Sensor - G- in the guide on the fuel delivery unit and push down until it engages.



- Install the fuel delivery unit. Refer to [“4.6 Fuel Delivery Unit, Removing and Installing”, page 219](#).





## 5 Connector Couplings, Disconnecting

Special tools and workshop equipment required

- ◆ Lever - Fuel Line - T10468-

Connector Coupling Allocation

### Note

- ◆ The connector couplings for fuel, vacuum and vent lines are color-coded. There is either a colored dot on the connector coupling or the release button is the corresponding color.
- ◆ The connector couplings must »audibly« engage when locking.
- ◆ Pull on the connector coupling to check for secure fit.

Connector Coupling	Color Coding on the Connector Coupling
Fuel supply	Black
Fuel Return Line	Blue
Ventilation	White, beige
Vacuum	Green



### WARNING

The fuel supply line is under pressure. Wear protective eye-wear and protective clothing to avoid injury and contact with skin. Place a cleaning cloth around the connection point before loosening hose connections. Remove the hose connection carefully to reduce the pressure.

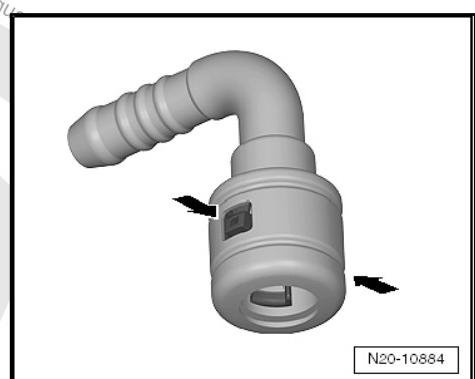
#### Version 1

Connector coupling with right and left release buttons -arrows-.

Opening

It is necessary to counterhold the fuel separating point -1-.

- Insert the -T10468- between the heat shield and the fuel line stop -arrow- -2- and counterhold it.



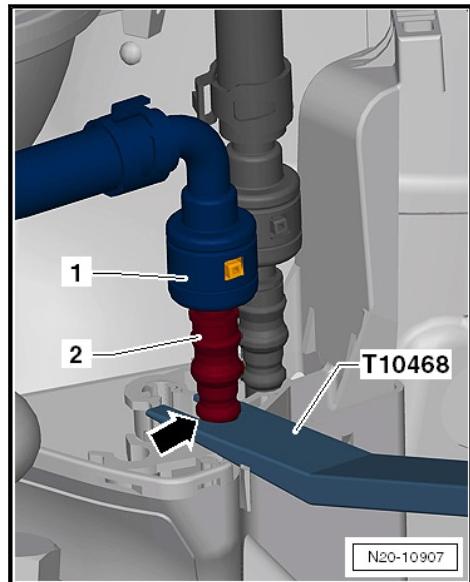


Continuation for all separating points on the fuel system

- Push the connector coupling -1- in the direction of -arrow A-.
- Press the release buttons and hold it down.
- Disconnect the connector coupling -1- from the fuel line -2- in the direction of -arrow B-.

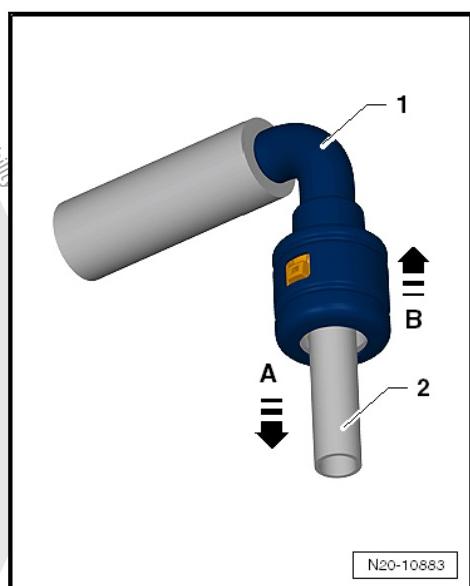
Follow the color coding during installation. Refer to [⇒ page 223](#)

The connector couplings must »audibly« engage when locking.



- Pull on the connector coupling to check for secure fit.

#### Version 2



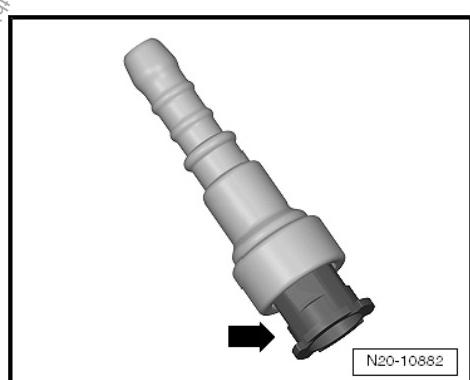
Coupling with pull release -arrow-

Opening

- Push the connector coupling -1- in the direction of -arrow A-.
- Pull the pull release -2- in the direction of -arrow B-.
- Pull the connector coupling -1- off the fuel line -3- in the direction of -arrow B-.

Follow the color coding during installation. Refer to [⇒ page 223](#)

The connector couplings must »audibly« engage when locking.





- Pull on the connector coupling to check for secure fit.

### Version 3

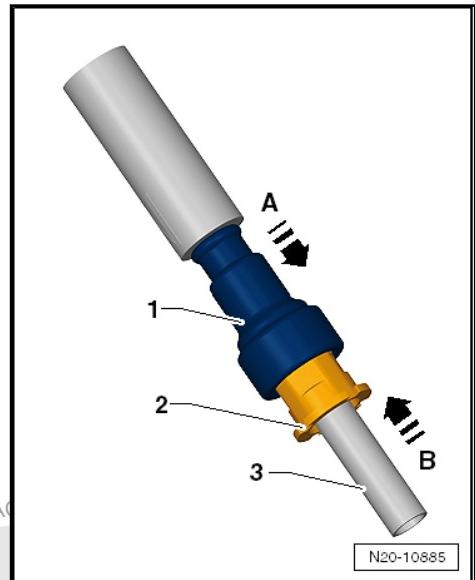
Coupling with button on the front -arrow-

Opening

- Press the release button -arrow- and disconnect couplings.

Follow the color coding during installation. Refer to [⇒ page 223](#)

The connector couplings must »audibly« engage when locking.



- Pull on the connector couplings to make sure they are secure.

### Version 4

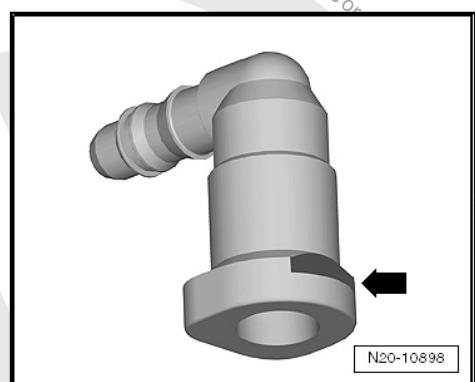
Connector coupling with right and left release buttons -arrows-.

Opening

- Push the connector coupling in the direction of -arrow A-.
- Press the release buttons -arrows- and disconnect coupling.

Follow the color coding during installation. Refer to [⇒ page 223](#)

The connector couplings must »audibly« engage when locking.



- Pull on the connector coupling to check for secure fit.

### Version 5

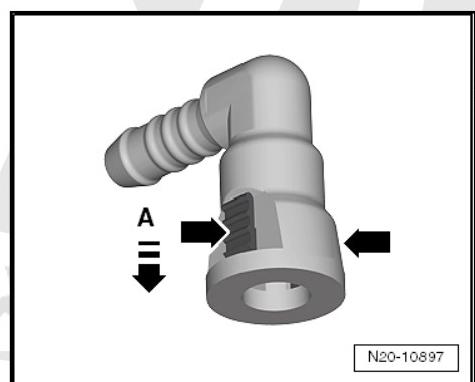
Connector coupling with right and left release buttons -arrows-.

Opening

- Press the release buttons -arrows- and disconnect coupling.

Follow the color coding during installation. Refer to [⇒ page 223](#)

The connector couplings must »audibly« engage when locking.



- Pull on the connector coupling to check for secure fit.

### Version 6

Connector coupling with right and left release buttons -arrows-.

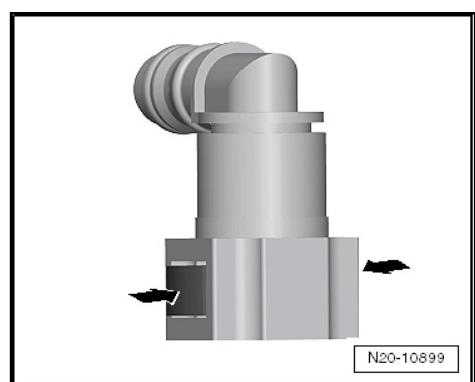
Opening

- Press the connector coupling -1- in the direction of -arrow- and hold it down.

- Press the release buttons -arrows- and disconnect coupling.

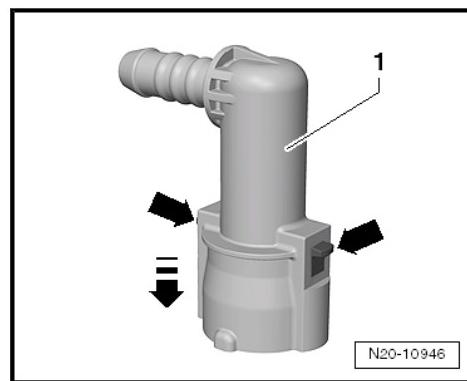
Note the color coding when installing. Refer to [⇒ page 223](#).

The connector couplings must »audibly« engage when locking.





- Pull on the connector coupling to check for secure fit.





## 6 Fuel Supply System, Servicing

- ⇒ [“6.1 General Information”, page 227](#)
- ⇒ [“6.2 Overview - Fuel Filter”, page 227](#)
- ⇒ [“6.3 Fuel Filter, Removing and Installing”, page 229](#)
- ⇒ [“6.4 Transfer Fuel Pump G6 , Checking”, page 229](#)
- ⇒ [“6.5 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Check-  
ing”, page 234](#)
- ⇒ [“6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing  
and Installing”, page 236](#)

### 6.1 General Information

#### Note

- ◆ Hose connections are secured with either spring or hose clamps.
- ◆ Always replace clamp-type clips with spring-type clips.
- ◆ -VAS6362- or the -VAS6340- are recommended for installing spring clips.

### 6.2 Overview - Fuel Filter

#### Special tools and workshop equipment required

- ◆ Hose Clip Pliers - VAS6362-



#### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to ⇒ [“1 Safety Precautions when Working on Fuel Supply System”, page 201](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ [“2 Guidelines for Clean Working Conditions”, page 202](#).

Always pay attention to these instructions before and during work.

Fuel Filter, Removing and installing. Refer to ⇒ [“6.3 Fuel Filter, Removing and Installing”, page 229](#).



### 1 - Fuel Supply Line

- Black
- Check for secure fit
- From Fuel Tank- All Vehicles Except Jetta from MY 2011 -Item 15- [⇒ Item 15 \(page 211\)](#)
- From Fuel Tank - Jetta from MY 2011 Only -Item 17- [⇒ Item 17 \(page 213\)](#)

### 2 - Screw

- 9 Nm

### 3 - Fuel Return Line

- Blue or with blue marking
- Check for secure fit
- To Fuel Tank- All Vehicles Except Jetta from MY 2011 -Item 16- [⇒ Item 16 \(page 211\)](#)
- To Fuel Tank - Jetta from MY 2011 Only -Item 18- [⇒ Item 18 \(page 213\)](#)

### 4 - Plug

- 5 Nm
- For water extraction
- Remove and extract approximately 100 cm<sup>3</sup> of fluid with Suction Pump - VAS5226-

### 5 - Seal

- Always replace

### 6 - Fuel Supply Line

- White or with white markings
- Check for secure fit
- To Auxiliary Fuel Pump - V393-
- Auxiliary Fuel Pump - V393- , Removing and installing. Refer to [⇒ "6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing", page 236](#)

### 7 - Fuel Return Line

- Blue or with blue marking
- Check for secure fit
- Item 4- [⇒ Item 4 \(page 286\)](#)

### 8 - Fuel Filter Upper Section

### 9 - Fuel Filter Insert

- Note the change intervals. Refer to ⇒ Rep. Gr. MS ; Maintenance Schedules (USA and Canada)

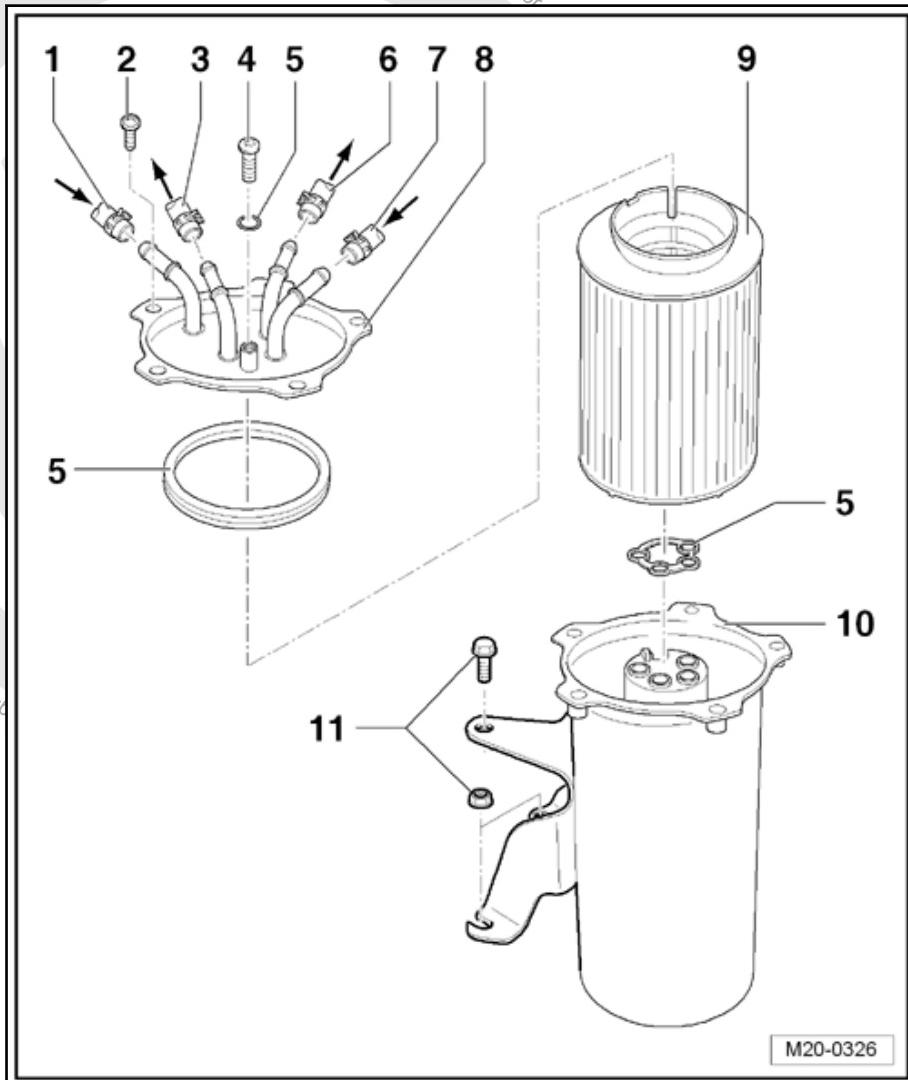
### 10 - Fuel Filter Lower Section

### 11 - Bolt

- 8 Nm

### 12 - Seal

- Always replace





## 6.3 Fuel Filter, Removing and Installing

Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Hose Clip Pliers - VAS6362-



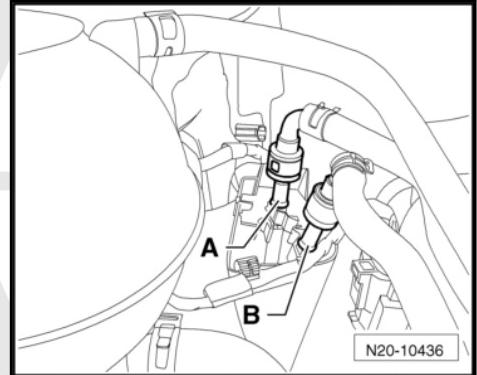
### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to ["1 Safety Precautions when Working on Fuel Supply System", page 201](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 202](#).

*Always pay attention to these instructions before and during work.*

Removing:

- Disconnect the fuel lines to the fuel tank.
- A - Fuel Supply Line, Black
- B - Fuel Return Line, Blue or with Blue Marking
- Seal the lines so that no dirt can enter the fuel system.
- Loosen the spring clamps with the -VAS6362- and remove the fuel hoses -Item 6- [Item 6 \(page 228\)](#) and -Item 7- [Item 7 \(page 228\)](#) from the fuel filter.
- Seal the lines so that no dirt can enter the fuel system.
- Remove the bolt and nut -Item 11- [Item 11 \(page 228\)](#).
- Remove the fuel filter upward.



Installing:

Install in reverse order of removal. Note the following:

- Bolt and nut tightening specification -Item 11- [Item 11 \(page 228\)](#).
- Route the fuel hoses without kinks.
- Check the fuel hoses for secure fit.
- Do not interchange the supply and return lines (the return line is blue or has a blue marking, the supply line is white or has a white marking).
- Clip the fuel hoses back into the retainers.
- Fill the fuel system. Refer to ["3.10 Fuel System, Filling/Bleeding", page 304](#).

## 6.4 Transfer Fuel Pump - G6- , Checking

[⇒ "6.4.1 Fuel Delivery Rate, Checking", page 229](#).

[⇒ "6.4.2 Power Supply, Checking", page 231](#)

[⇒ "6.4.3 Current Draw, Checking", page 232](#).

### 6.4.1 Fuel Delivery Rate, Checking

Special tools and workshop equipment required



- ◆ Vehicle Diagnostic Tester
- ◆ Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565-
- ◆ Pickup clamp - VAG1526B/2-
- ◆ Analog/Digital Multimeter - FLU83III-
- ◆ Pressure Tester Kit - VAS6551-
- ◆ Container > 3L with measuring scale



### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to **⇒ "1 Safety Precautions when Working on Fuel Supply System", page 201**.
- ◆ Pay attention to the guidelines for clean working conditions. Refer to **⇒ "2 Guidelines for Clean Working Conditions", page 202**.

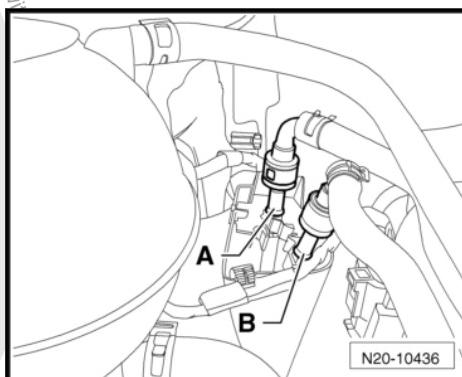
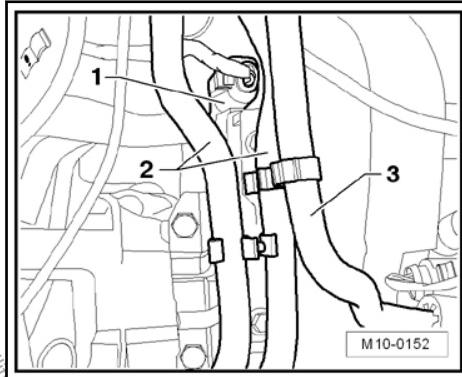
Always pay attention to these instructions before and during work.

### Test Conditions:

- The battery voltage must be at least 12.0V.
- The fuses must be OK.
- All electrical consumers for example lamps and rear window defogger, must be switched off.

### Test Sequence

- Disconnect -1- from the Auxiliary Fuel Pump - V393- .



- Disconnect the fuel supply line (black) -A- to the fuel tank.
- Connect the line from the -VAS6550- on the fuel supply line -A- to the fuel tank.
- Guide the open end of the hose from the -VAS6550- into the measuring container.
- Open the shut-off valves in front of and behind the pressure gauge in the flow direction and connect the lower shut-off valve.

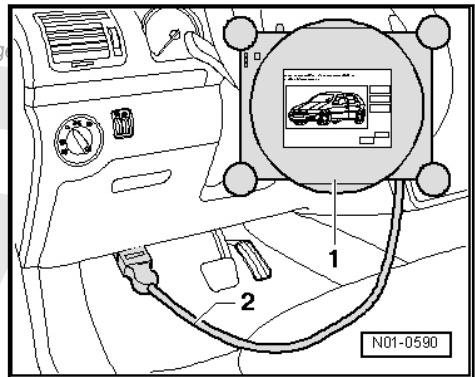


- Connect the Vehicle Diagnostic Tester -1- as follows:
- Connect diagnostic cable -2- to Data Link Connector (DLC) in driver footwell.
- Switch the ignition on.
- Perform "Guided Functions, check electric fuel pump(s)". Refer to Vehicle Diagnostic Tester .



#### Note

The fuel pump now runs for 30 seconds.



- Turn off the ignition.
- Read the quantity of fuel in the measuring container.

#### Specified Values

- Minimum 1000 ml for 30 seconds

If the quantity of fuel delivered is less than the specified value:

- Check the fuel pump voltage supply. Refer to ["6.4.2 Power Supply, Checking", page 231](#). Check the current draw. Refer to ["6.4.3 Current Draw, Checking", page 232](#).

## 6.4.2 Power Supply, Checking

### Special tools and workshop equipment required

- ◆ Analog/Digital Multimeter - FLU83III-
- ◆ Pickup Clamp - VAG1526B/2-
- ◆ Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565-

### Test Conditions

- The fuses must be OK.
- Battery voltage must be minimum 12 V. Connect a battery charger if necessary.
- All electrical consumers for example lamps and rear window defogger, must be switched off.

### Vehicles with 2.0L Diesel Engines

- Disconnect the connector from the Auxiliary Fuel Pump - V393- or from the Fuel Pump 2 - V277- (in-line electric fuel pump) inside the engine compartment.

### Continuation for All Vehicles

- Remove the rear bench seat. Refer to [Body Interior; Rep. Gr. 72 ; Rear Seats; Bench Seat / Single Seats, Removing and Installing](#).
- Fold the carpet to the side or forward.
- Remove the cover from the fuel delivery unit.
- Switch the ignition on. Fuel pump must run audibly for approximately 2 seconds.
- Switch off the ignition.

If the fuel pump does not run:

- Disconnect the connector from the fuel delivery unit flange.
- Connect the -VAS5565- between the connector and the flange.



- Connect the -FLU83III- to the test contacts -1 and 5- on the adapter.
- Connect the Vehicle Diagnostic Tester and perform the Guided Function "Check electrical fuel pumps".

**Note**

The fuel pump is now activated for 30 seconds.

- Read the voltage on the -FLU83III- : specified value = approximate battery voltage.

If there is no voltage:

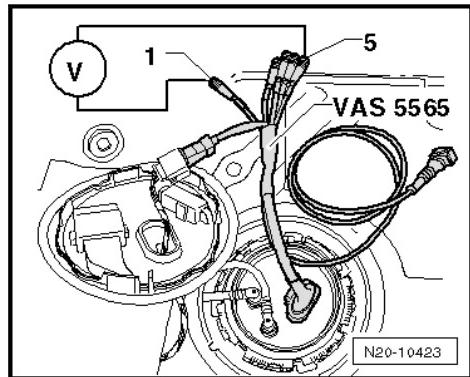
- Check the fuel pump relay activation and check wires for interruption and short circuit using the Vehicle Diagnostic Tester .

Voltage supply OK:

- Remove the fuel delivery unit. Refer to ["4.6 Fuel Delivery Unit, Removing and Installing", page 219](#).
- Check if the electrical wiring between the flange and fuel pump is connected and has continuity.

If an open circuit is not detected:

- Replace the fuel delivery unit.



### 6.4.3 Current Draw, Checking

#### Special tools and workshop equipment required

- ◆ Vehicle Diagnostic Tester
- ◆ Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565-
- ◆ Pickup clamp - VAG1526B/2-
- ◆ Analog/Digital Multimeter - FLU83III-
- ◆ Pressure Tester Kit - VAS6551-



#### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to ["1 Safety Precautions when Working on Fuel Supply System", page 201](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 202](#).

Always pay attention to these instructions before and during work.

#### Test Conditions

- The battery voltage must be at least 12.0V.
- The fuses must be OK.
- All electrical consumers for example lamps and rear window defogger, must be switched off.
- Fuel temperature in the fuel tank above 10 °C (50 °F).

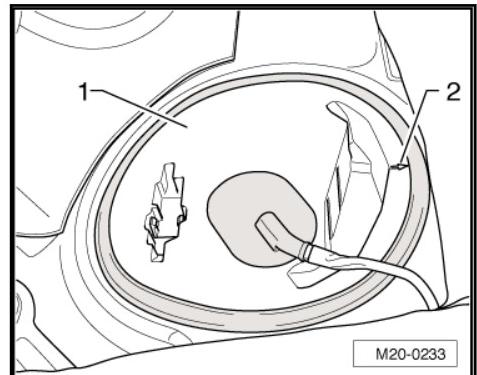


### Note

The battery voltage and the temperature of the diesel fuel strongly influence the current draw of the fuel pump. Make sure the battery voltage is at least 12 Volts and the temperature of the diesel fuel inside the fuel tank is not at the freezing point.

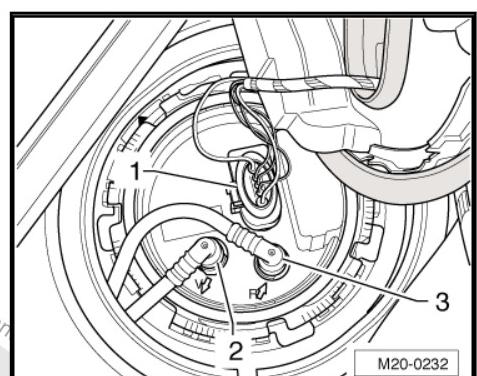
### Test Sequence

- Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .
- Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



M20-0233

- Disconnect -1- from the fuel delivery unit flange.



M20-0232

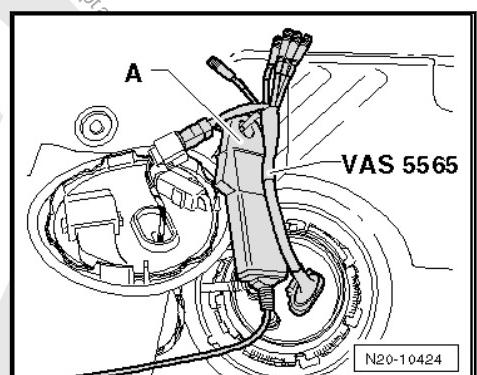
- Connect the -VAS5565- between the connector and the flange.
- Connect the current probe -A- to the red cable with the word "current probe" on the -VAS5565- .



### Note

The current probe of the -FLU83III- can also be connected to the red cable - with the label "current probe" - for the -VAS5565- .

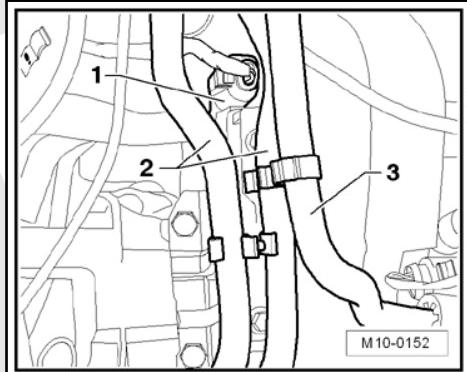
- Connect the -FLU83III- to the Clamp Meter .



N20-10424



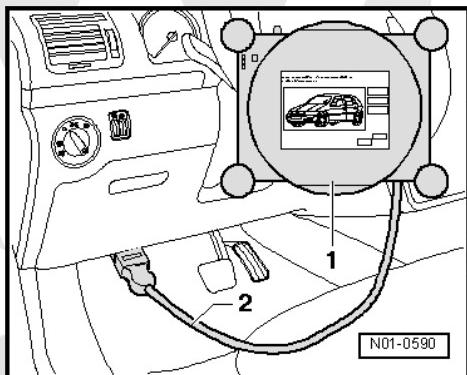
- Disconnect the connector -1- from the Auxiliary Fuel Pump - V393- (in right side of engine compartment).



- Connect the Vehicle Diagnostic Tester 1- as follows:
- Connect diagnostic cable -2- to Data Link Connector (DLC) in driver footwell.
- Switch the ignition on.
- Perform "Guided Functions, check electric fuel pump(s)". Refer to Vehicle Diagnostic Tester .



The Fuel Pump is now activated for 60 seconds.



- Read the current draw on the Analog/Digital Multimeter .

#### Specified Value:

- minimum 5.5 amp
- maximum 7.5 amp
- Switch off the ignition.

If the current draw is outside of the specified value:

- Replace the fuel delivery unit if the Fuel Pump is faulty.  
Refer to ["4.6 Fuel Delivery Unit, Removing and Installing", page 219](#) .

## 6.5 Auxiliary Fuel Pump - V393- (Inline Fuel Pump), Checking

### Special tools and workshop equipment required

- ◆ Diesel Pressure Tester Kit - VAS6551-

### Test Conditions:

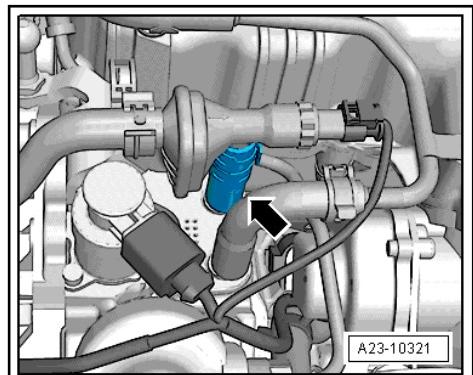
- Battery voltage at least 12.5 V.
- The fuel filter is OK.
- Fuel tank is minimum  $\frac{1}{2}$  full.
- Ignition switched off.
- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#) .



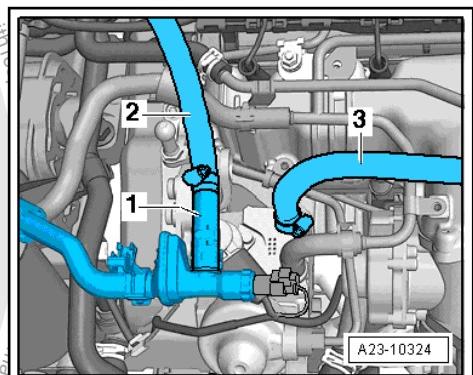
### WARNING

- ◆ *Follow the guidelines and instructions for clean working conditions when working on the fuel system. Refer to ["2 Guidelines for Clean Working Conditions", page 202](#).*
- ◆ *Always follow these guidelines and instructions for clean working conditions before and during work.*
- ◆ *Before opening the fuel system, lay a clean cloth around the connection point and carefully loosen it, which lowers the pressure.*

- Remove the fuel supply line -arrow- from the high pressure pump.



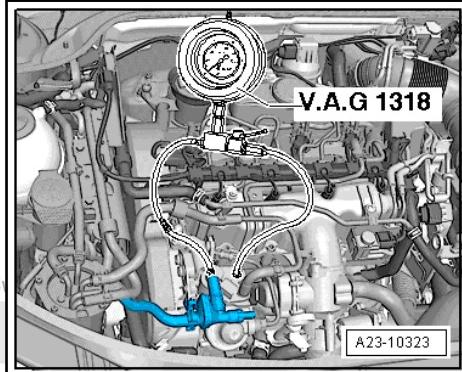
Connect the -VAS6551- using the corresponding adapter -2- to the fuel supply line -1-. Connect the other adapter -3- from the -VAS6551- to the open connection on the high pressure pump.





**Note**

- ◆ The -VAS6551- is switched on in the fuel supply line.
- ◆ Illustration shows -VAG1318- use -VAS6551- .
- Connect the Vehicle Diagnostic Tester and perform the Guided Function "Check electrical fuel pumps".



**Note**

The fuel pump is now activated for 30 seconds.

- Let the fuel pumps run until the highest fuel pressure is reached.
- Specified value: minimum 3.5 bar (50.76 psi)

If the specified value is not obtained:

Check the connection between the fuel pressure gauge and fuel line for leaks.

Check the pressure gauge for leaks.

Check the fuel lines and their connections for leaks.

Fuel filter clogged?

Check the delivery rate of the Transfer Fuel Pump - G6-. Refer to ["6.4.1 Fuel Delivery Rate, Checking", page 229](#).

**Note**

Check the fuel system for leaks.

## 6.6 Auxiliary Fuel Pump - V393- (Inline Fuel Pump), Removing and Installing

Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Hose Clip Pliers - VAS6362-



### DANGER!

- ◆ Observe safety precautions when working on fuel supply. Refer to ["1 Safety Precautions when Working on Fuel Supply System", page 201](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 202](#).

Always pay attention to these instructions before and during work.

Removing:

- Disconnect the connector -2- from the Exhaust Pressure Sensor 2 - G451- -1-.





## 7 Electronic Engine Output Control (EPC)

- ⇒ [“7.1 EPC System Function”, page 238](#)
- ⇒ [“7.2 Overview - Accelerator Pedal Module”, page 238](#)
- ⇒ [“7.3 Accelerator Pedal Module, Removing and Installing”, page 239](#)

### 7.1 EPC System Function

For EPC, the throttle valve is not operated by a cable from the accelerator pedal. There is no mechanical connection between the gas pedal and the throttle valve.

The position of the accelerator pedal is transmitted to the Engine Control Module - J623- via two accelerator pedal position sensors (adjustable resistances, accommodated in one housing), that are connected to the accelerator pedal.

The position of the accelerator pedal (driver controlled) is a main input for the Engine Control Module - J623- .

Throttle valve operation occurs via an electric motor (throttle valve actuator) in the Throttle Valve Control Module - GX3- and this occurs over the entire engine speed and engine load spectrum.

The throttle valve is operated by the throttle drive according to the instructions of the Engine Control Module - J623- .

With the engine stopped and the ignition switched on, the Engine Control Module - J623- activates the throttle valve actuator according to the specifications from the Throttle Position Sensor - G69- . This means, if the accelerator pedal is depressed half way, the throttle drive opens the throttle valve to the same degree. The throttle valve is then opened approximately half way.

With engine running (under load) the Engine Control Module - J623- can open and close the throttle valve independently of the Throttle Position Sensor - G69- .

This means, for example, that the throttle valve could be fully opened even though the accelerator pedal has only been depressed half way. This has the advantage of preventing torque losses at the throttle valve.

After evaluating the torque requirements of the various components (such as the A/C system, automatic transmission, ABS/ESP, etc.), the Engine Control Module - J623- calculates the optimal throttle valve opening angle for the current situation.

Aside from that, it results in clearly better pollutant output and consumption values under certain load conditions.

“E-Gas” is a system containing all components that contribute to recognizing, controlling and monitoring the position of the throttle valve, for example the Throttle Position Sensor - G69- , Throttle Valve Control Module - GX3- , EPC Indicator Lamp - K132- , Engine Control Module - J623- .

### 7.2 Overview - Accelerator Pedal Module



### 1 - Connector

- Black 6-pin

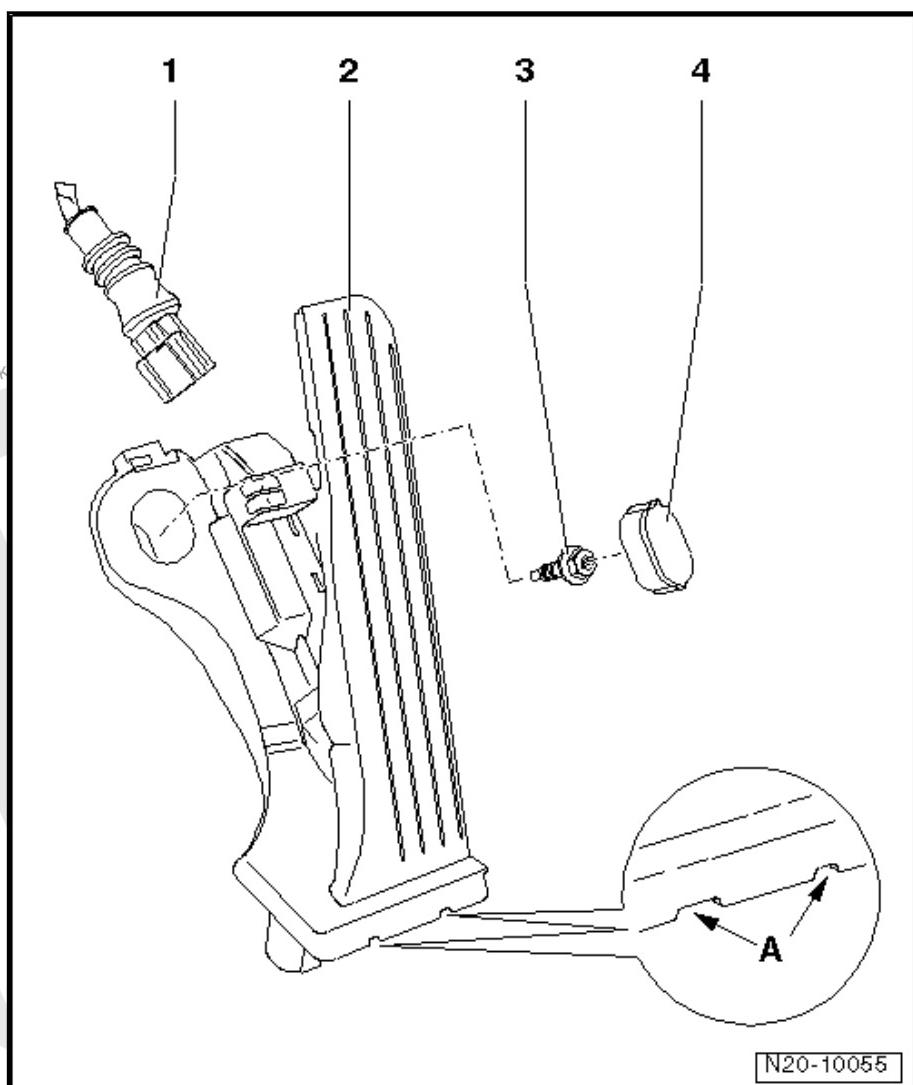
### 2 - Accelerator Pedal Module

- With Accelerator Pedal Position Sensor - G79- and Accelerator Pedal Position Sensor 2 - G185-
- Not adjustable
- A- Openings for Release Tool
- Removing and installing. Refer to ["7.3 Accelerator Pedal Module, Removing and Installing", page 239](#).
- Checking. Refer to Vehicle Diagnostic Tester.

### 3 - Bolt

- 9Nm

### 4 - Cap



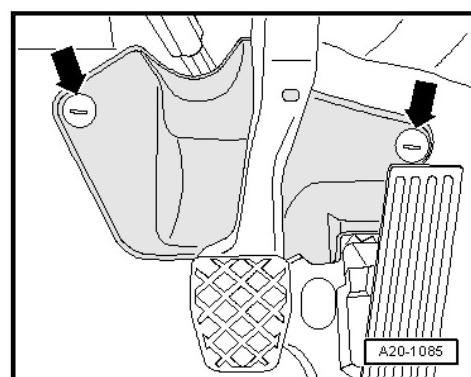
## 7.3 Accelerator Pedal Module, Removing and Installing

### Special tools and workshop equipment required

- ◆ Accelerator Pedal Module Release Tool - T10238-

### Removing:

- Remove the steering column cover -arrows-.
- Pry out the cap -Item 4- [Item 4 \(page 239\)](#) using a screwdriver.
- Remove the bolt -Item 3- [Item 3 \(page 239\)](#) .
- Slide the -T10238- into the designated openings for it until it stops and remove accelerator pedal module.

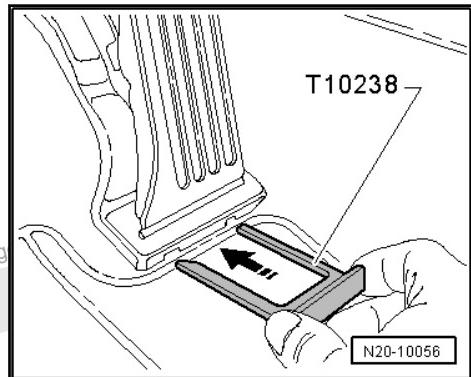




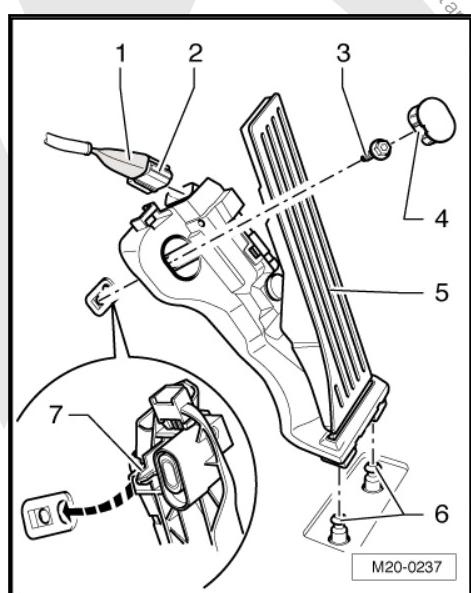
- Disconnect the connector from the accelerator pedal module.

**Installing:**

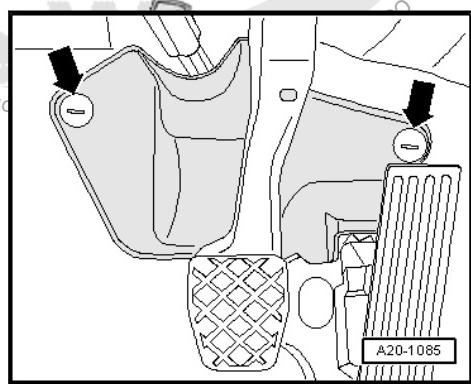
- Connect the connector -2- to the accelerator pedal module -5- and push the rubber grommet -1- onto the connector again.
- Press the accelerator pedal module onto the retaining pins -6-.
- Insert centering pin -7- into hole on vehicle floor.



- Secure the accelerator pedal module with the bolt -3-.
- Tightening specification -Item 3- [⇒ Item 3 \(page 239\)](#).
- Install the cap -4-.



- Install the steering column cover -arrows-.





## 21 – Turbocharger, Supercharger

### 1 Safety Precautions when Working on Charge Air System And Turbocharger



#### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ *Route all lines and wires in their original locations.*
- ◆ *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*

If testing equipment is required during a road test, note the following:

- ◆ The testing equipment must always be secured to the rear seat and operated by a second technician from this location.

If the vehicle is involved in a collision while testing equipment is operated from the front passenger seat, the person sitting in that seat could be seriously injured when the airbag deploys.





## 2 Guidelines for Clean Working Conditions

**When Working on the Charge Air System and Turbocharger,  
Carefully Follow the "7 rules" for Clean Working Conditions:**

- ◆ Thoroughly clean the connection points and the surrounding area before loosening.
- ◆ Place the removed parts on a clean surface and cover them. Only use lint-free cloths.
- ◆ Carefully cover or seal opened components if the repair is not performed immediately.
- ◆ Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use parts that have been loosely stored or unpackaged (for example, in tool boxes etc.).
- ◆ Transport and protective packaging and sealing caps are to be removed only immediately prior to installation.
- ◆ During repairs, clean oil from connections and hose ends.
- ◆ When the fuel system is open: avoid working with compressed air if possible. Do not move the vehicle if possible.

When working on the turbocharger, carefully observe the following rules for clean working conditions:





### 3 Turbocharger

- ⇒ “3.1 General Information”, page 243
- ⇒ “3.2 Overview - Turbocharger with Exhaust Manifold and Attachments”, page 244
- ⇒ “3.3 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBEA, CJAA”, page 250
- ⇒ “3.4 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CEGA”, page 253
- ⇒ “3.5 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581, Replacing”, page 256
- ⇒ “3.6 Exhaust Gas Temperature Sensor 1 G235, Removing and Installing”, page 262

#### 3.1 General Information



##### Note

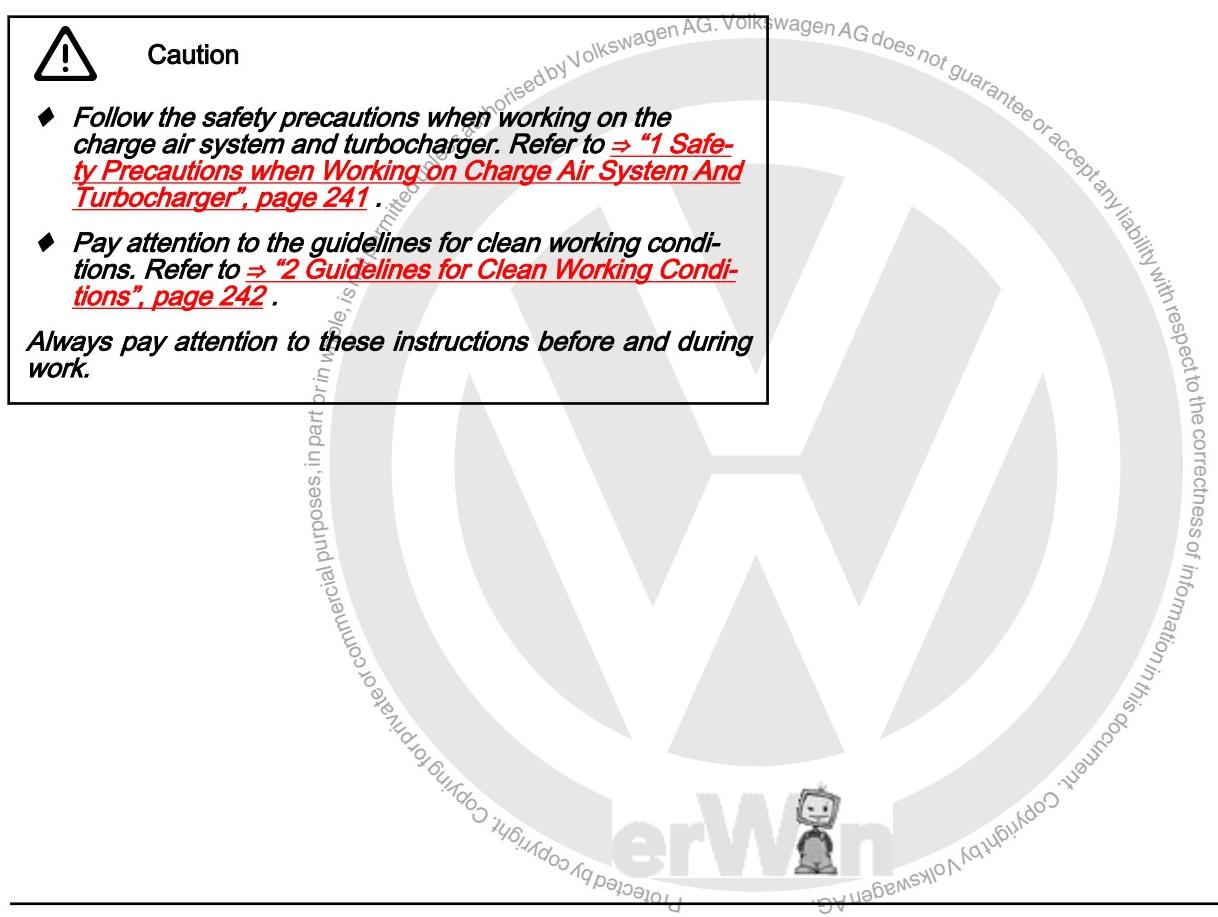
- ◆ Various hose connections are secured.
- ◆ The charge air system must be properly sealed.
- ◆ Always replace the self-locking nuts, seals, gaskets and clamps.
- ◆ Fill with engine oil before installing the turbocharger oil supply line on the connections
- ◆ After installing the turbocharger, let engine idle for approximately one minute to ensure adequate oil supply to the turbocharger.



##### Caution

- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ “1 Safety Precautions when Working on Charge Air System And Turbocharger”, page 241 .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 242 .

Always pay attention to these instructions before and during work.





## 3.2 Overview - Turbocharger with Exhaust Manifold and Attachments



### Caution

- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to [⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 241](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to [⇒ "2 Guidelines for Clean Working Conditions", page 242](#).

Always pay attention to these instructions before and during work.

[⇒ "3.2.1 Engine Codes CBEA, CJAA", page 244](#)

[⇒ "3.2.2 Engine Codes CBDA, CBDB and CEGA", page 248](#)

### 3.2.1 Engine Codes CBEA, CJAA



### Note

Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to [⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#).



### 1 - Bolt

- 8 Nm

### 2 - Warm Air Collector Plate

- To the warm air intake connecting hose on the air filter -Item 12- [⇒ Item 12 \(page 312\)](#)

### 3 - Bolt

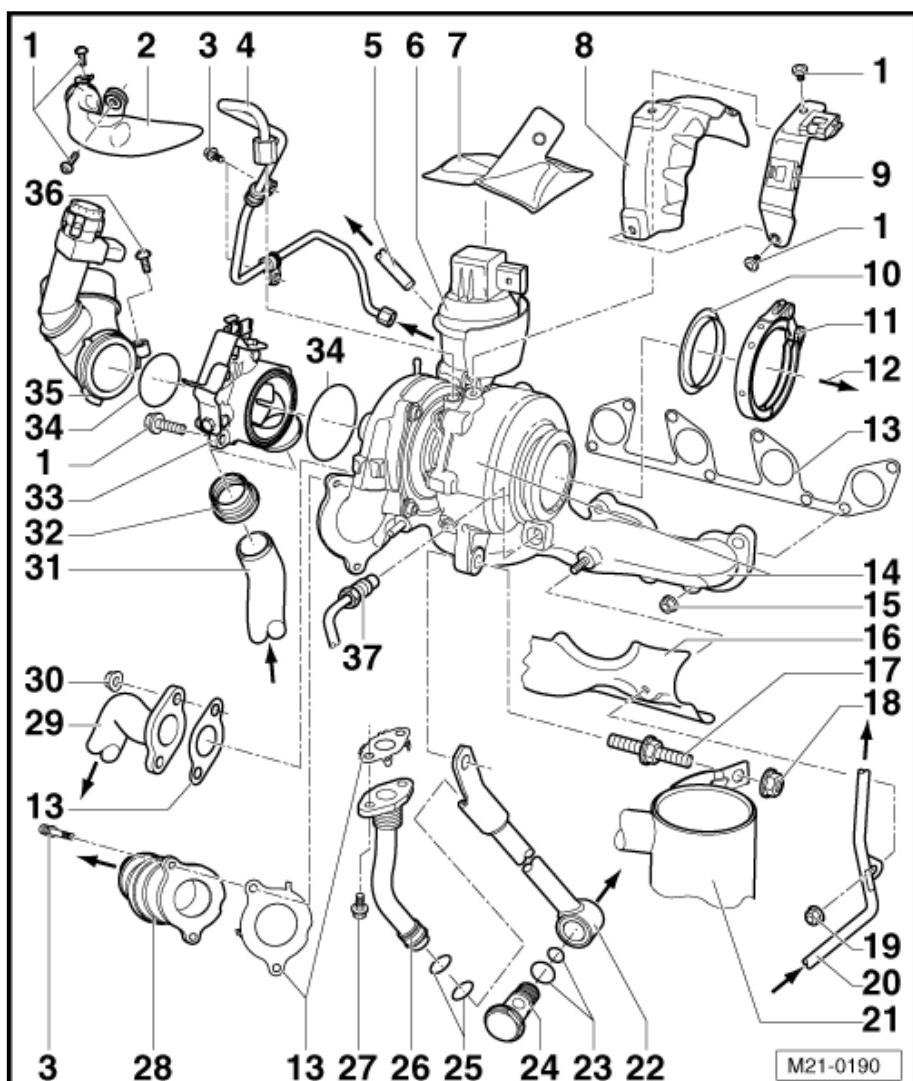
- 10 Nm

### 4 - Oil Supply Line

- 22 Nm
- Do not change the angles of the oil supply line
- Install without tension
- From oil filter bracket -Item 6- [⇒ Item 6 \(page 165\)](#)
- Removing and installing. Refer to [⇒ "4.3 Oil Supply Line to Turbocharger, Removing and Installing", page 169](#).
- Before installing, check the oil supply line for clear passage
- Fill with engine oil before installing the turbocharger oil supply line on the connections

### 5 - Vacuum Hose

- Check for secure fit and kink free routing
- To the Wastegate Bypass Regulator Valve - N75-
- Connection diagram for vacuum hoses. Refer to [⇒ "4.5 Vacuum Hose Connection Diagram", page 271](#).



### 6 - Vacuum Diaphragm

- With the Charge Air Pressure Actuator Position Sensor - G581-
- Removing and installing. Refer to [⇒ "3.5 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581 Replacing", page 256](#).
- Unit with turbocharger and exhaust manifold (cannot be replaced separately)

### 7 - Heat Shield

- Replace if damaged

### 8 - Heat Shield

### 9 - Bracket

- For wiring harness

### 10 - Seal

- Always replace

### 11 - Clamp

- 7 Nm
- Always replace
- Note the installation position Refer to [⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#).



## 12 - To the Particulate Filter

- Refer to ["1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#)

## 13 - Seal

- Always replace
- Note the installation position

## 14 - Turbocharger

- Unit with exhaust manifold and pressure cell (cannot be replaced separately)
- Removing and installing. Refer to ["3.3 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBEA, CJAA", page 250](#).

## 15 - Nut

- 23 Nm
- Always replace
- Grease the exhaust manifold stud bolts with Hot Bolt Paste - G 052 112 A3- .

## 16 - Heat Shield

### 17 - Stud Bolt

- 20 Nm

### 18 - Nut

- 23 Nm
- installed on the hex stud bolt -Item 17- [⇒ Item 17 \(page 246\)](#) on the turbocharger

### 19 - Nut

- 23 Nm
- Secure on the exhaust manifold with the heat shield -Item 16- [⇒ Item 16 \(page 246\)](#)

## 20 - Control Line

- 23 Nm
- Do not change the angles of the control line
- between the EGR housing -Item 16- [⇒ Item 16 \(page 381\)](#) and Exhaust Pressure Sensor 1 - G450
- To loosen at the housing -Item 16- [⇒ Item 16 \(page 381\)](#) remove the exhaust gas recirculation filter -Item 9- [⇒ Item 9 \(page 380\)](#)
- Install without tension

## 21 - Filter

- For the EGR
- Item 9- [⇒ Item 9 \(page 380\)](#)

## 22 - Support

- For the turbocharger

## 23 - Seal

- Always replace

## 24 - Banjo Bolt

- 60 Nm
- Always replace

## 25 - O-Ring

- Always replace

## 26 - Oil Return Pipe

- Install without tension

## 27 - Bolt

- 15 Nm

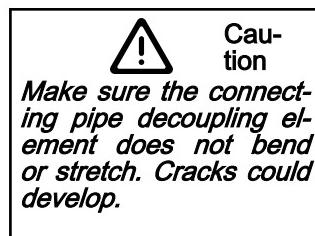
## 28 - Pulsation Damper

- To the »hot« side connecting hose, upper -Item 13- [⇒ Item 13 \(page 266\)](#)



## 29 - Connecting Pipe

- Always replace



- Between the exhaust manifold and intake manifold -Item 5- [⇒ Item 5 \(page 308\)](#)
- Install without tension

## 30 - Nut

- 20 Nm
- Grease the exhaust manifold stud bolts with Hot Bolt Paste - G 052 112 A3- .

## 31 - Connecting Pipe

- From the exhaust gas recirculation housing -Item 2- [⇒ Item 2 \(page 380\)](#)
- For removing and installing, also loosen the connections -Item 33- [⇒ Item 33 \(page 247\)](#) on the turbocharger

## 32 - Seal

- Replace if damaged

## 33 - Connection

### 34 - O-Ring

- Replace if damaged

### 35 - Intake Scoop

- Check for secure fit
- Clean if there is contamination
- from the intake hose on the air filter -Item 1- [⇒ Item 1 \(page 312\)](#)
- With Positive Crankcase Ventilation Heating Element - N79-

Removing:

- Disconnect the crankcase ventilation hose at the intake scoop.
- Remove the bolt -Item 36- [⇒ Item 36 \(page 247\)](#) .
- Rotate the intake scoop clockwise and remove it from the connections -Item 33- [⇒ Item 33 \(page 247\)](#) .

Installing:

- Clean the intake scoop. It must be free of oil and grease.
- Slide the intake scoop onto the connections -Item 33- [⇒ Item 33 \(page 247\)](#) and rotate it counterclockwise until it engages on the connections.
- Tighten the bolt -Item 36- [⇒ Item 36 \(page 247\)](#) .
- Install a new crankcase ventilation hose.

## 36 - Bolt

- 8 Nm



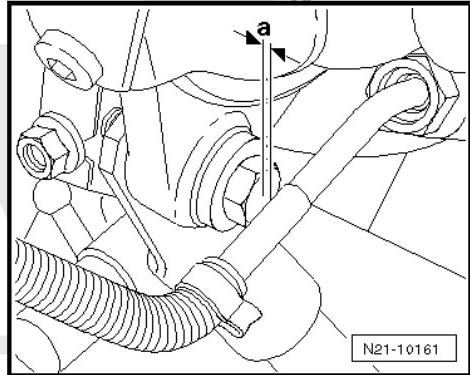
### 37 - Exhaust Gas Temperature Sensor 1 - G235-

- 45 Nm
- Note the installation position Refer to [Fig. "Installed Position, Exhaust Gas Temperature Sensor with Angled Shaft", page 248](#). Removing and installing. Refer to ["3.6 Exhaust Gas Temperature Sensor 1 G235 , Removing and Installing", page 262](#)
- Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

Installed Position, Exhaust Gas Temperature Sensor with An-gled Shaft



Always keep the dimension -a- of 3 to 5 mm to the threaded connection for the turbocharger support when installing the Exhaust Gas Temperature Sensor with an angled shaft.



### 3.2.2 Engine Codes CBDA, CBDB and CE-GA



Overview - Front Exhaust Pipe with Particulate Filter. Refer to ["2.1 Overview - Front Exhaust Pipe with Particulate Filter", page 368](#).



## 1 - 10 Nm

### 2 - Oil Supply Line

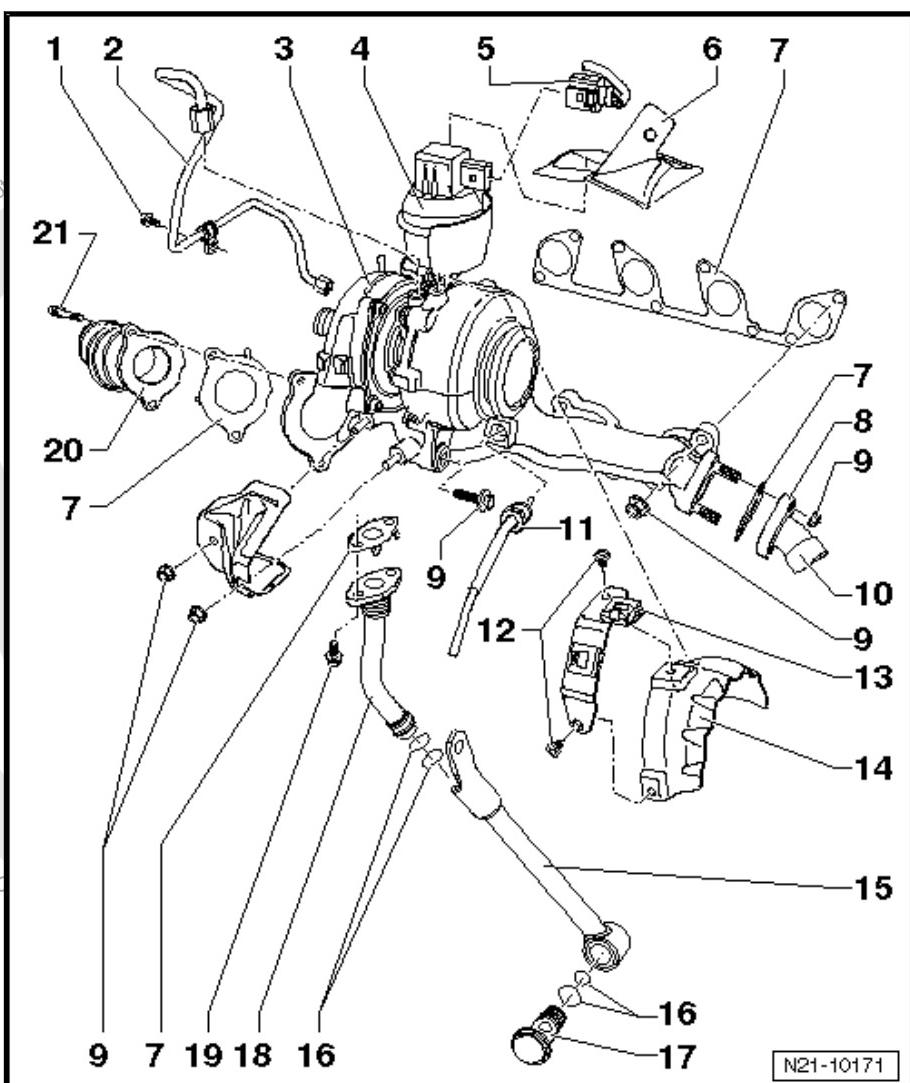
- Removing and installing. Refer to ["4.3 Oil Supply Line to Turbocharger, Removing and Installing", page 169](#)
- Before installing, check the oil supply line for clear passage
- Before installing, fill turbocharger with engine oil at connection of oil supply line

### 3 - Turbocharger

- Replace completely together with the exhaust manifold and the pressure cell
- Removing and installing. Refer to ["3.4 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CEGA", page 253](#).

### 4 - Vacuum Diaphragm

- With the Charge Air Pressure Actuator Position Sensor - G581-
- Removing and installing. Refer to ["3.5 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581, Replacing", page 256](#).



### 5 - Connector

- To the Charge Air Pressure Actuator Position Sensor - G581-

### 6 - Heat Shield

- Replace if damaged

### 7 - Seal

- Always replace

### 8 - Connecting Pipe

- To EGR cooler

### 9 - 20 Nm

### 10 - Decoupling element

- Do not bend or stretch

### 11 - Exhaust Gas Temperature Sensor 1 - G235-

- 45 Nm
- Coat the thread on the sensor with Hot Bolt Paste - G 052 112 A3-
- Note the installation position Refer to ["Fig. Installed Position, Exhaust Gas Temperature Sensor with Angled Shaft", page 250](#).

### 12 - 10 Nm



### 13 - Bracket

- For oil supply line

### 14 - Heat Shield

### 15 - Support

- Between turbocharger and cylinder block

### 16 - Seal

- Always replace

### 17 - Banjo Bolt

- 60 Nm
- Always replace

### 18 - Oil Return Pipe

### 19 - Bolt

- 15 Nm

### 20 - Pulsation Damper

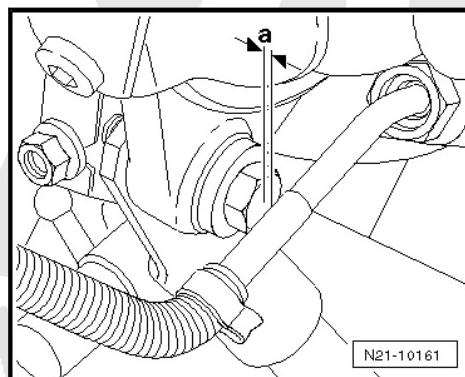
### 21 - Bolt

- 10 Nm

Installed Position, Exhaust Gas Temperature Sensor with An-gled Shaft



Always keep the dimension -a- of 3 to 5 mm to the threaded connection for the turbocharger support when installing the Exhaust Gas Temperature Sensor with an angled shaft.



## 3.3 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Co-des CBEA, CJAA

Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Diesel Engine Tool Set - 17mm - T10395A-



### Caution

- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ["1 Safety Precautions when Working on Charge Air System And Turbocharger", page 241](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 242](#).

Always pay attention to these instructions before and during work.



## Removing



### Caution

If mechanical damage is found on exhaust turbocharger, for example a destroyed compression wheel, it is not enough to just replace the turbocharger. Perform the following steps to prevent subsequent damage.

Check the air filter housing, the air filter insert and the intake hoses for contamination. Refer to [⇒ "3.15 Overview - Air Filter", page 311](#), Overview - Air Filter

If foreign objects are found in the charge air system:

- ◆ Check the entire charge air circuit and the charge air cooler for foreign objects. Refer to [⇒ "4.2 Overview - Charge Air Cooler Components", page 265](#), Overview - Charge Air Cooling System Components
- ◆ Replace the connecting pipe between the exhaust manifold and intake manifold -Item 29- [⇒ Item 29 \(page 246\)](#).
- ◆ Clean the entire charge air circuit and replace the charge air cooler if necessary.
- ◆ Check the housing and the exhaust gas recirculation cooler for foreign objects. Refer to [⇒ "3.1.1 Overview - Exhaust Gas Recirculation, Engine Codes CBDA, CBDB, CEGA", page 378](#), Overview - Exhaust Gas Recirculation Components
- ◆ Check the oil lines on the turbocharger for contamination and foreign objects. Refer to [⇒ "3.2 Overview - Turbocharger with Exhaust Manifold and Attachments", page 244](#), Overview - Turbocharger with Exhaust Manifold and Attachments

- Remove the particulate filter with NOx reduction catalytic converter. Refer to [⇒ "1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing", page 345](#).



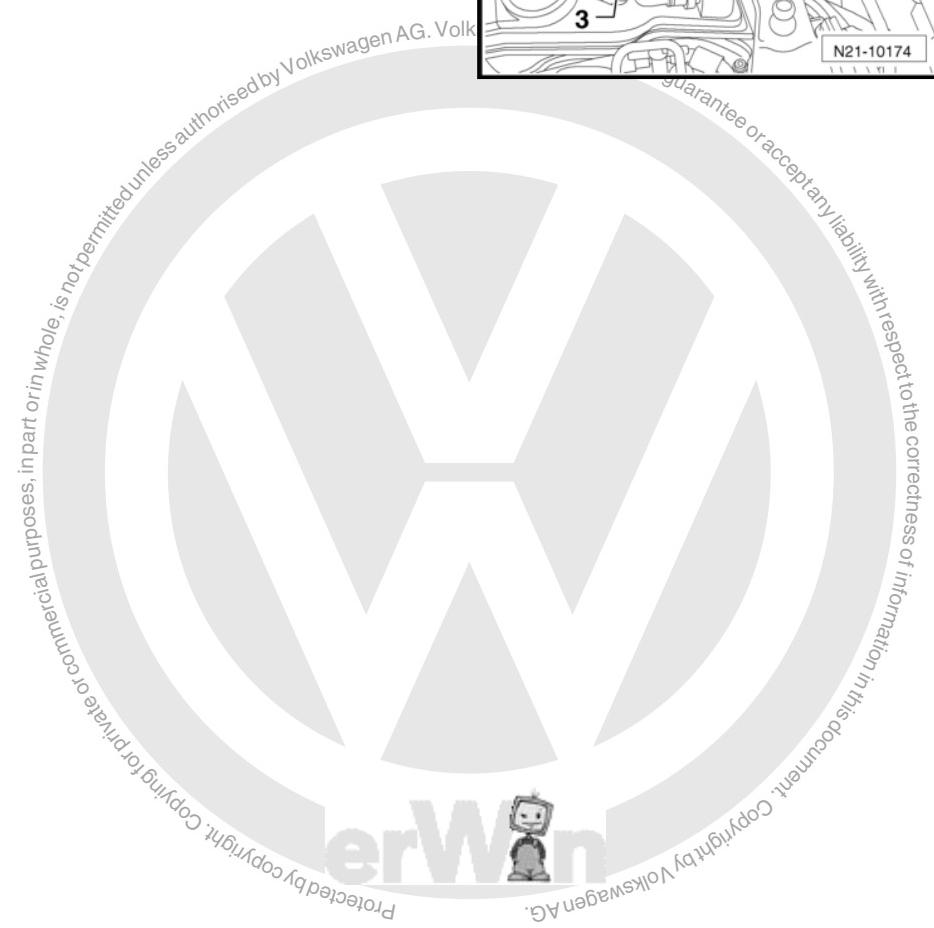
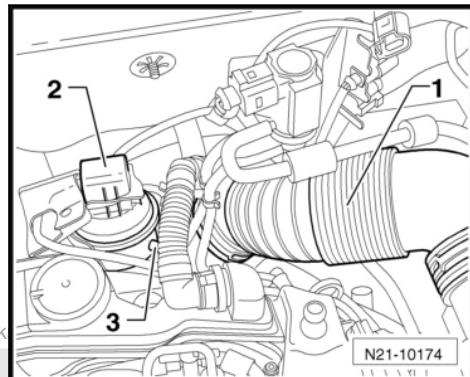
### Caution

The Exhaust Gas Temperature Sensor 1 - G235- covers the upper threaded connection on the turbocharger support and must not be bent. It may not be removed.

- Remove the Exhaust Gas Temperature Sensor 1 - G235- with -T10395A- .
- Remove the control line between the EGR housing and the Exhaust Pressure Sensor 1 - G450- -Item 8- [⇒ Item 8 \(page 380\)](#) .
- Remove the housing with the exhaust gas recirculation cooler. Refer to [⇒ "3.1.2 Overview - Exhaust Gas Recirculation, Engine Codes CJAA, CBEA", page 379](#)

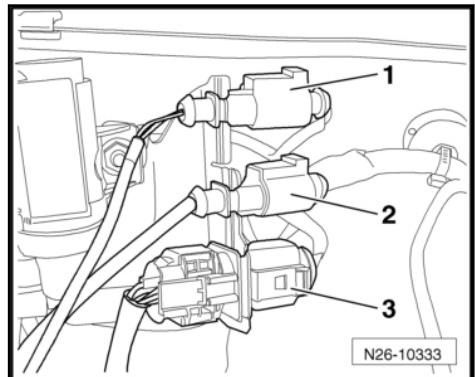


- Disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -2- on the on the turbocharger vacuum dia-phragm.
- Disconnect the vacuum hose -3- at the turbocharger vacuum diaphragm.





- Disconnect the »black« connector for the Exhaust Gas Temperature Sensor 1 - G235- -2- at the plenum chamber bulkhead.
- Guide the wire out of the retainer on the plenum chamber bulkhead and on the turbocharger.
- Remove the connecting pipe -Item 31- [⇒ Item 31 \(page 247\)](#).
- Remove the oil supply line. Refer to [⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 169](#).
- Remove the banjo bolt -Item 24- [⇒ Item 24 \(page 246\)](#) from the turbocharger support.
- Remove the hex bolt -Item 17- [⇒ Item 17 \(page 246\)](#) from the turbocharger support.
- Rotate the lower section of the support 90° and remove the support downward from the upper section.
- Remove the heat shield -Item 16- [⇒ Item 16 \(page 246\)](#) on the exhaust manifold.
- Remove the exhaust manifold nuts -Item 15- [⇒ Item 15 \(page 246\)](#).
- Remove the turbocharger with the exhaust manifold from the cylinder head. Turn it so that the intake side points downward and remove the turbocharger with the exhaust manifold downward.



### Installing



#### Caution

*Before installing, check if the oil return pipe decoupling element is bent or stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return pipe before installing the turbocharger.*

Install in reverse order of removal. Note the following:

- Always replace the self-locking nuts, seals, gaskets and clamps.
- Insert the turbocharger with the pressure side upward.
- Position the charge air pipe connecting hose before securing the turbocharger.
- Pay attention to the installation position of the Exhaust Gas Temperature Sensor 1 - G235-. Refer to [⇒ Fig. “Installed Position, Exhaust Gas Temperature Sensor with Angled Shaft”](#), page 248.
- Replace the banjo bolt with the turbocharger support gaskets as well as the oil return pipe O-rings.
- Do not stretch the oil return pipe decoupling element when installing the turbocharger support.

### 3.4 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CEGA

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-



### Caution

- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ **"1 Safety Precautions when Working on Charge Air System And Turbocharger", page 241**.
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ **"2 Guidelines for Clean Working Conditions", page 242**.

Always pay attention to these instructions before and during work.

## Removing



### Caution

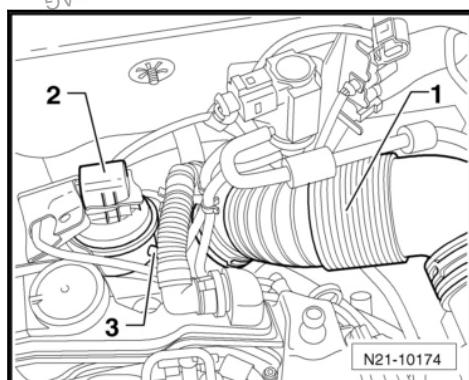
If mechanical damage is found on exhaust turbocharger, for example a destroyed compression wheel, it is not enough to just replace the turbocharger. Perform the following steps to prevent subsequent damage.

Check the air filter housing, the air filter insert and the intake hoses for contamination. Refer to ⇒ **"3.15 Overview - Air Filter", page 311**, Overview - Air Filter

If foreign objects are found in the charge air system:

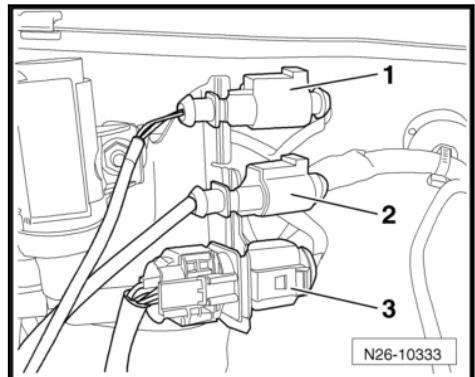
- ◆ Check the entire charge air circuit and the charge air cooler for foreign objects. Refer to ⇒ **"4.2 Overview - Charge Air Cooler Components", page 265**, Overview - Charge Air Cooling System Components
- ◆ Clean the entire charge air circuit and replace the charge air cooler if necessary.
- ◆ Check the housing and the exhaust gas recirculation cooler for foreign objects. Refer to , Overview - Exhaust Gas Recirculation Components
- ◆ Check the oil lines on the turbocharger for contamination and foreign objects. Refer to ⇒ **"3.2 Overview - Turbocharger with Exhaust Manifold and Attachments", page 244**, Overview - Turbocharger with Exhaust Manifold and Attachments

- Remove the intake line -1- and disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -2- on the turbocharger.
- Disconnect the vacuum line -3- on the turbocharger.

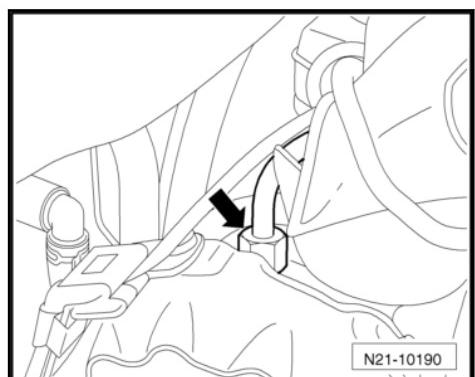




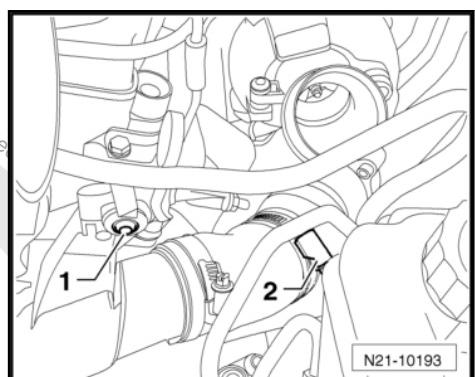
- Disconnect the connector for Exhaust Gas Temperature Sensor 1 - G235- -1- on the plenum chamber bulkhead and guide the wire out of the retainers.



- Remove the oil supply line on the turbocharger -arrow-.



- Remove the charge air pipe screw -1-, loosen the clamp -2- and pull off the connecting hose from the turbocharger as far as possible.
- Remove the particulate filter. Refer to ["2 Exhaust System, Engine Codes CBDA, CBDB and CEGA", page 368](#).



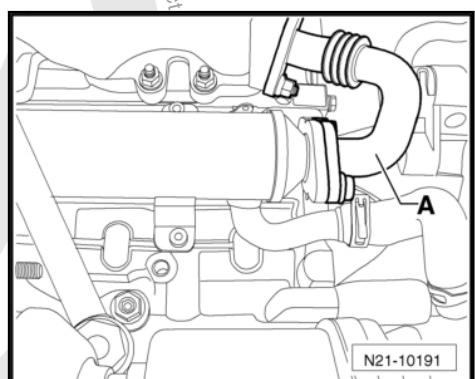
- Remove the connecting pipe -A- to the EGR cooler.



#### Caution

*The Exhaust Gas Temperature Sensor 1 - G235- covers the upper threaded connection on the turbocharger support and must not be bent. It may not be removed.*

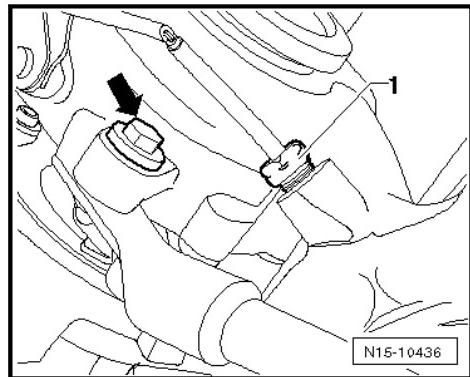
- Remove the Exhaust Gas Temperature Sensor 1 - G235- .
- Remove the right axle shaft from the bevel box. Refer to [Suspension, Wheels, Steering; Rep. Gr. 40](#) .
- Remove the banjo bolt -Item 24- [Item 24 \(page 246\)](#) from the turbocharger support.





- Remove the upper screw -arrow- from the support on the turbocharger.
- Rotate the lower section of the support 90° and remove the support downward from the upper section.
- Remove the heat shield on the exhaust manifold.
- Remove the exhaust manifold nuts.
- Remove the turbocharger and then turn it so that the intake side is facing downward and the remove the turbocharger downward.

#### Installing



#### Caution

*Before installing, check if the oil return line decoupling element is hidden and therefore stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return line before installing the turbocharger.*

- Install in reverse order of removal. Note the following:
  - ◆ Insert the turbocharger with the pressure side upward.
  - ◆ Position the charge air pipe connecting hose before securing the turbocharger.
  - ◆ Pay attention to the installation position of the Exhaust Gas Temperature Sensor 1 - G235-. Refer to [Fig. "Installed Position, Exhaust Gas Temperature Sensor with Angled Shaft"](#), page 250 :
  - ◆ Replace the banjo bolt for the turbocharger support and the O-rings for the oil return line.
  - ◆ Be careful not to overstretch the decoupling element for the oil return line when installing the turbocharger support.

### 3.5 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor - G581-, Replacing

#### Special tools and workshop equipment required

- ◆ Actuator Socket - 10mm - T10422-
- ◆ Union Nut Socket - T40055-
- ◆ Ring Wrench 10x12mm - T10423-
- ◆ Wrench - Open End - 14mm - T10461-
- ◆ Vehicle Diagnostic Tester



#### Caution

*The specified special tools, in particular the -T10422-, are designed exclusively for use according to the following work procedure and may not be used for other screw connections. Higher torques can cause deformation.*

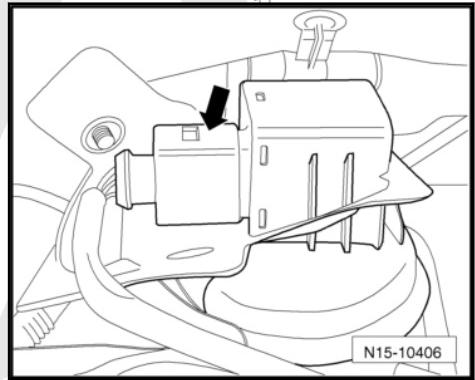


### Note

*There is a replacement part kit available for replacing the vacuum diaphragm with Charge Air Pressure Actuator Position Sensor - G581-. Refer to Parts Catalog.*

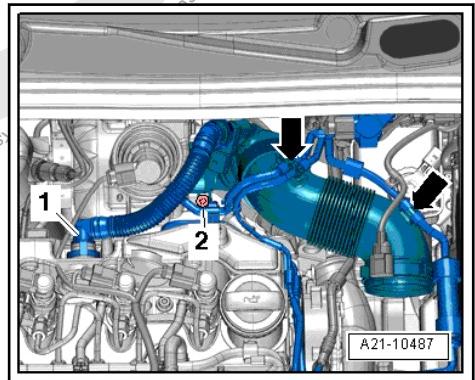
### Removing

- Remove the air filter housing with the mass air flow sensor and connecting pipe. Refer to ["3.15 Overview - Air Filter", page 311](#).
- Open the heat shield mat and disconnect the connector -arrow- from the Charge Air Pressure Actuator Position Sensor - G581- .



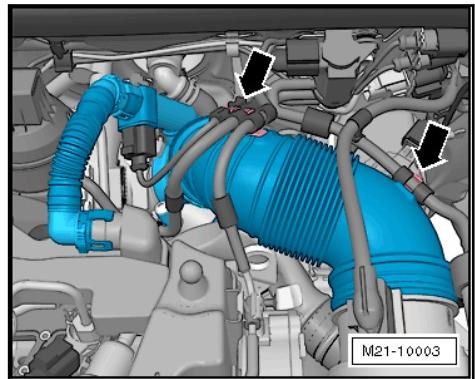
#### - All Vehicles Except Jetta from MY 2011

- Press the release buttons and remove the crankcase ventilation connecting pipe -1- from the cylinder head cover.
- Free up the vacuum hoses -arrows-.
- Unscrew the bolt -2- (permanent) and tilt the air duct pipe with the intake tube toward the rear and remove from the turbocharger.
- Seal the opening on the turbocharger with the cap from the replacement part kit.



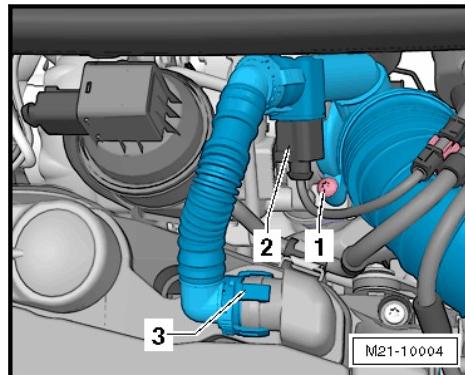
#### Jetta from MY 2011

- Free up the vacuum hoses -arrows-.

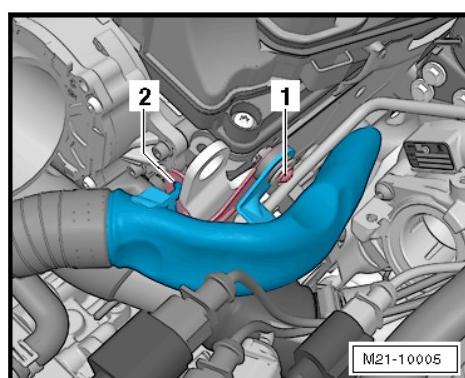




- Press the release buttons and remove the crankcase ventilation connecting pipe -3- from the cylinder head cover.
- Remove the connector -2-.
- Loosen the bolt -1- (permanent) and tilt the air guide pipe with the intake tube backward and remove from the turbocharger.
- Seal the opening on the turbocharger with the cap from the replacement part kit.



- Remove the bolt -1- and the warm air pipe from the guide -2-.



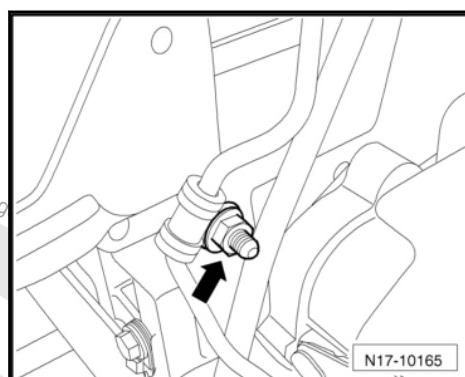
#### Continuation for All Vehicles

- Remove the vacuum line on the turbocharger.
- Unscrew the securing nut -arrow- of the oil supply line/vacuum line connection on the cylinder head.

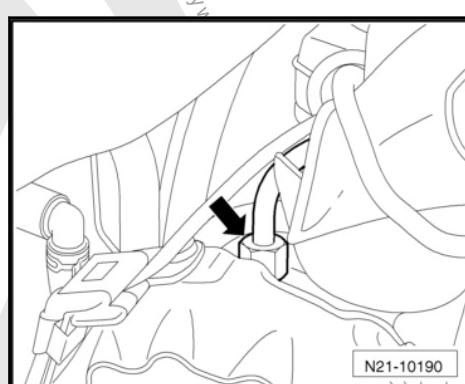


##### Caution

*When disconnecting the oil supply line, the connection must be counter-held. Risk of subsequent damage.*



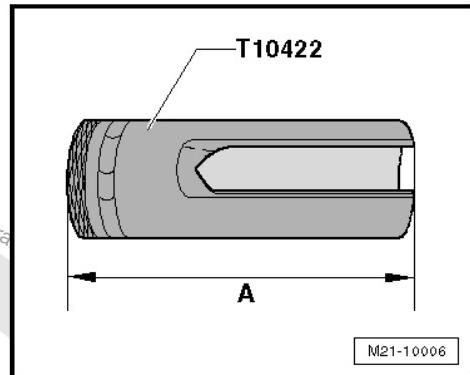
- Counterhold the connection with a -T10461- and remove the oil supply line -arrow- from the turbocharger using the -T40055- .
- Seal the oil supply opening on the turbocharger with plugs from the replacement part kit.





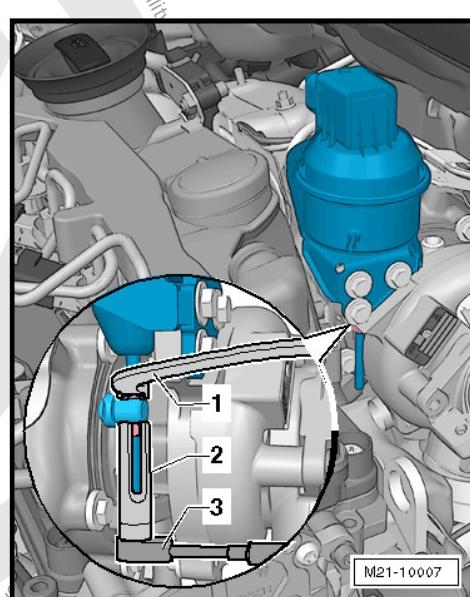
### Jetta from MY 2011

- Use the -T10422- at the dimension -A-.
- ◆ -A- = 57 mm

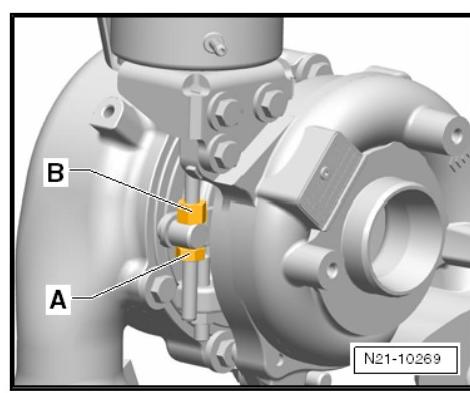


### Continuation for All Vehicles

- Position the -T10423- -1- and -T10422- -2- with the Reversible Ratchet -3- as shown.



- Counterhold the lock nut -B- with the -T10423- and unscrew the securing nut -A- with the -T10422A- from the control rod.





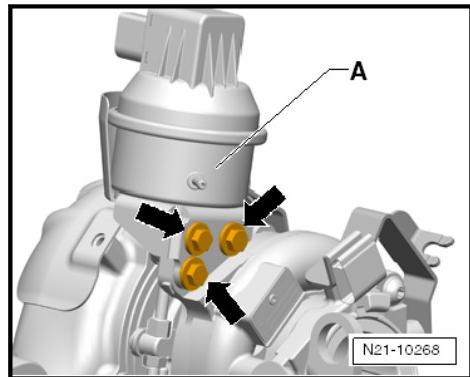
- Unscrew the bolts of the pressure cell -arrows- and remove vacuum diaphragm -A-.

### Installing



#### Caution

*Only use new screws and nuts from the replacement part kit.*

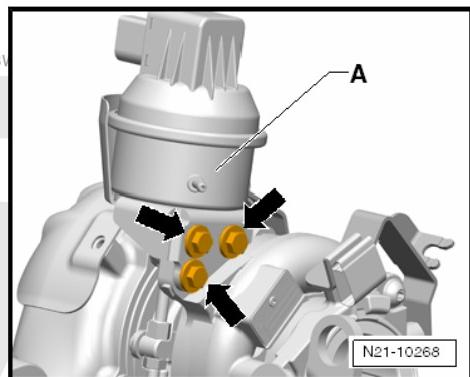


- Remove the lower nut of the control rod from the new vacuum diaphragm if necessary.
- Screw the lock nut onto the control rod by hand to the stop in the direction of the pressure cell.
- Conduct the control rod through the adjusting lever on the turbocharger, install the vacuum diaphragm -A-, and insert the bolts.
- Tighten the bolts -arrows- to 8 Nm.



#### Note

*Ensure that the guide moves easily on the control rod.*



- Remove the protective cap, install the oil supply line on the turbocharger, and tighten to 22 Nm.
- Connect the connector -2- to the Charge Air Pressure Actuator Position Sensor - G581- and connect the heat shield mat.
- Connect the Vehicle Diagnostic Tester .

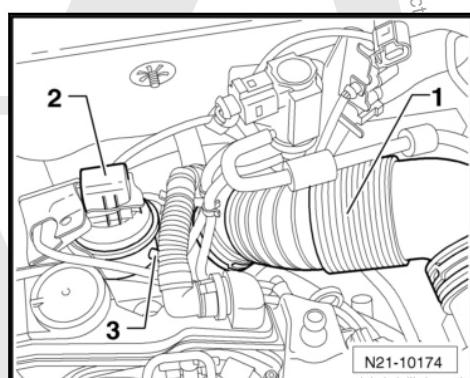
### Selecting Operating Mode:

- Press the "vehicle self-diagnosis" button on the display.

### Vehicle System Selection:

- Press the "01 - engine electronics" button on the display.

The display shows the control module identification and the coding for the engine control module.



### Selecting Diagnosis Function:

- Press the "011 - measured values" button on the display.
- Enter the measured value block "120" via the 10-key keyboard and confirm the input with the "Q" button.
- Connect the -VAS6213- to the vacuum diaphragm.
- Set a voltage of 0.760 V by generating a vacuum while observing the lowest value of the measured value block.

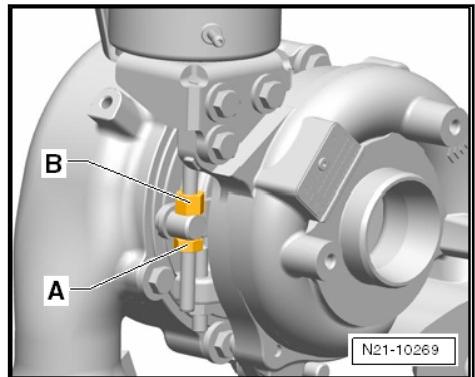


#### Caution

*Maintain a constant vacuum and voltage of 0.760 V during the subsequent adjustment procedure for the control rod.*



- Slowly screw lock nut -B- of the control rod down by hand. The adjusting lever is on the lower »stop«.
- Counter-hold lock nut -B- and turn securing nut -A- on the control rod against the adjustment lever. Tighten slightly with the -T10423- .
- Release the vacuum from the vacuum diaphragm.
- Observe the lowest value of the measured value block. With no pressure, a value of 3.30 to 3.90 V must be set.
- Attach the -T10422A- , counterhold the lock nut -B- with the -T10423- and tighten the securing nut -A-.



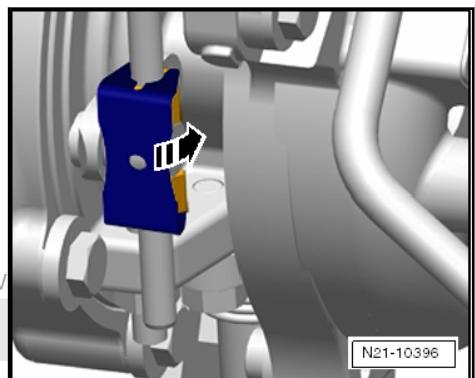
#### Caution

*Generate a vacuum of  $0.75 \pm 0.05$  bar at the vacuum diaphragm to ensure that the adjustment lever is at the »stop«. A voltage of 0.760 V must be set in this process.*

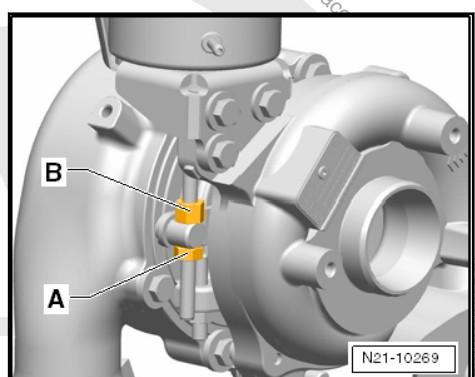
#### Voltage Value OK.

- Manually press the locking plate onto the control rod and turn it  $90^\circ$  in the direction of the -arrow-.
- Seal the control rod/nut connection with sealing wax from the replacement part kit.

#### Voltage Value Not OK.

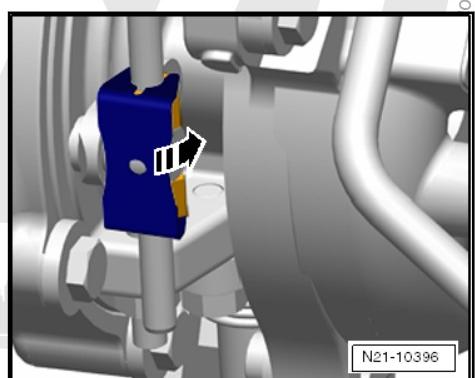


- Counterhold the lock nut -B-, loosen the control rod nut -A- and correct the value by rotating the lock nut -B-.
- Counter-hold the lock nut -B-, counter-rotate the nut -A-, and tighten with the -T10422A- .



- Manually press the locking plate onto the control rod and turn it  $90^\circ$  in the direction of the -arrow-.
- Seal the control rod/nut connection with sealing wax from the replacement part kit.

#### Continuation





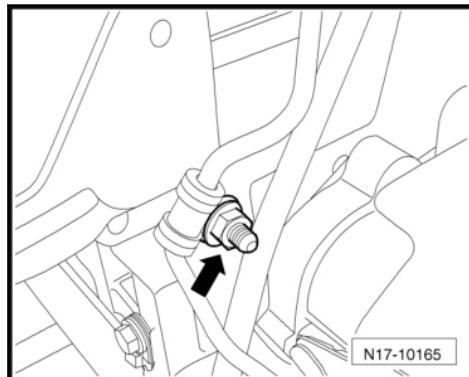
- Place the securing nut -arrow- of the oil supply line/vacuum line connection on the cylinder head and tighten.
- Remove the cap on the turbocharger.
- Reassemble the engine.
- Start the engine and delete the DTC memory.
- Check the adjustment as follows:

#### Selecting Diagnosis Function:

- Press the "006 - basic setting" button on the display.
- Enter the measured value block "120" via the 10-key keyboard and confirm the input with the "Q" button.
- Press the "activate" button on the lower half of the screen.
- Observe the value in the lower window. It must fluctuate between 0.65-0.85 V and 3.30-3.90 V (pressure cell alternates between the two end positions).

If the voltage values are OK:

- End the basic setting.



## 3.6 Exhaust Gas Temperature Sensor 1 - G235- , Removing and Installing

### Special tools and workshop equipment required

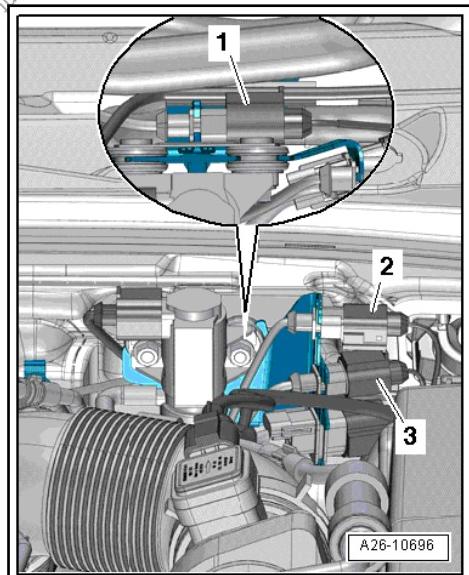
- ◆ Diesel Engine Tool Set - 17mm - T10395A-

### Removing



Ignore -1 and 2-.

- Disconnect the connector -3- for the Exhaust Gas Temperature Sensor 1 - G235- and free up the wire.
- Remove the EGR system filter. Refer to ⇒ ["3.2 EGR Filter, Removing and Installing", page 381](#).





### Note

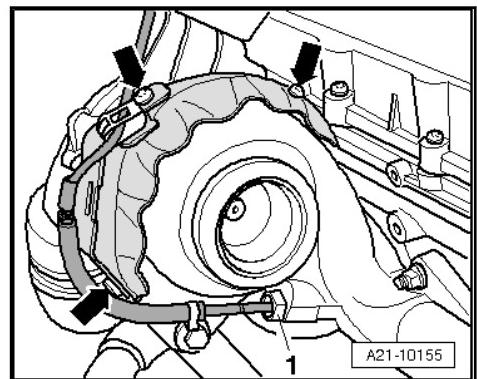
*The threaded connection is accessible from underneath.*

- Remove Exhaust Gas Temperature Sensor 1 - G235- -1- from the exhaust manifold.



### Note

*Ignore the -arrows-.*



### Installing

Install in reverse order of removal while noting the following:

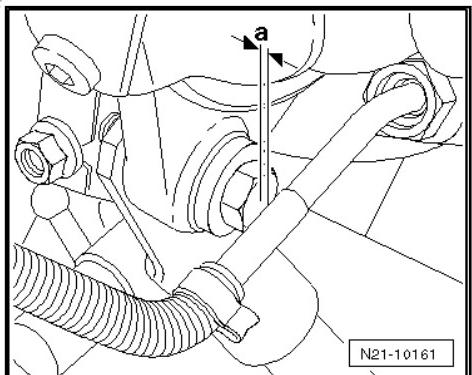


### Note

- ◆ Coat the exhaust gas temperature sensor thread with hot bolt paste. Refer to Parts Catalog.
- ◆ When installing, bring all cable ties back to same positions.

Exhaust Gas Temperature Sensor 1 -G235- installation position:

- The angled shaft must be -a- 3 to 5 mm from the threaded connector for the turbocharger support.
- Install the EGR system filter. Refer to ⇒ “[3.2 EGR Filter, Removing and Installing](#)”, page 381 .
- Connections and wire routing. Refer to ⇒ [Wiring diagrams, Troubleshooting & Component locations](#).



### Tightening Specification

Component	Tightening Specification
Exhaust Gas Temperature Sensor 1 - G235-	45 Nm



## 4 Charge Air System

- ⇒ “4.1 General Information”, page 264
- ⇒ “4.2 Overview - Charge Air Cooler Components”, page 265
- ⇒ “4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling”, page 267
- ⇒ “4.4 Charge Air System, Checking for Leaks”, page 269
- ⇒ “4.5 Vacuum Hose Connection Diagram”, page 271
- ⇒ “4.6 Vacuum Hose Connection Diagram, Engine Codes CBDA, CBDB, CEGA”, page 272
- ⇒ “4.7 Vacuum System, Checking”, page 273

### 4.1 General Information



#### Note

- ◆ Charge air system must be properly sealed.
- ◆ All hose connections for the charge air system are secured by screw-type clamps, spring-type clamps or by connector couplings. Be sure to follow the assembly guidelines when installing the connectors. Refer to ⇒ “4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling”, page 267.
- ◆ Tighten the screw-type clamps by hand using a screwdriver is not permitted.
- ◆ Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.



#### Caution

- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ “1 Safety Precautions when Working on Charge Air System And Turbocharger”, page 241 .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 242 .

Always pay attention to these instructions before and during work.



## 4.2 Overview - Charge Air Cooler Components



### Caution

- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ["1 Safety Precautions when Working on Charge Air System And Turbocharger", page 241](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 242](#).

Always pay attention to these instructions before and during work.



**1 - Bolt**

- 5 Nm

**2 - Bearing**

- For the charge air cooler

**3 - Charge Air Cooler**

- To remove, bring the lock carrier into the service position. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Lock Carrier; Service Position .

**4 - Connecting Hose**

- Replace the seal if it is damaged or if there are leaks.
- Check for secure fit
- »Cold« side, bottom
- Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling. Refer to ⇒ [“4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling”, page 267](#)

**5 - Screw Clamp**

- 5 Nm

**6 - To the Throttle Valve Control Module - J338-**

- Item 9- ⇒ [Item 9 \(page 308\)](#)

**7 - Connecting Hose**

- »Cold« side, top
- Check for secure fit

**8 - Charge Air Pressure Sensor - G31-**

- With Intake Air Temperature Sensor - G42-

**9 - Bolt**

- 3 Nm

**10 - Rubber Grommet**

- Replace if damaged

**11 - Bolt**

- 8 Nm

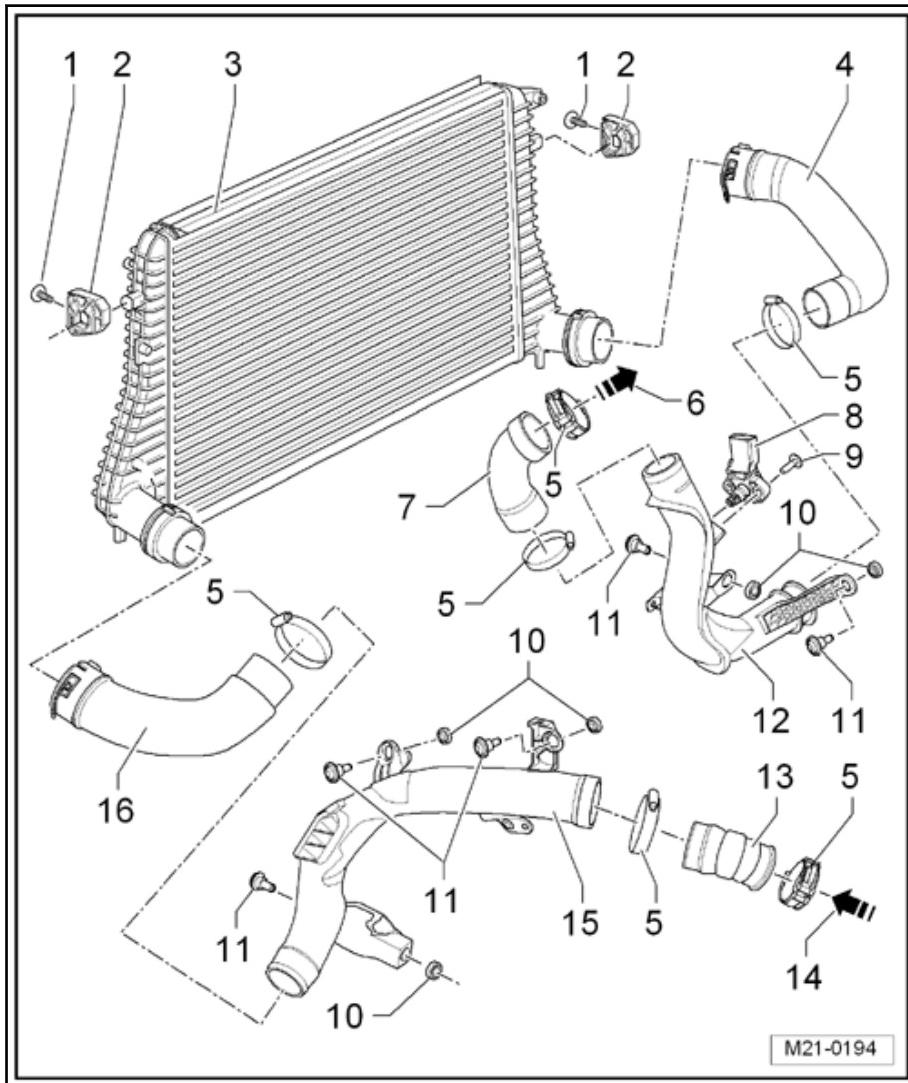
**12 - Charge Air Pipe**

- »Cold« side

**13 - Connecting Hose**

- »Hot« side, top
- Check for secure fit

**14 - From the Turbocharger**





## 15 - Charge Air Pipe

- »Hot« side

## 16 - Connecting Hose

- Replace the seal if it is damaged or if there are leaks.
- Check for secure fit
- »Hot« side, bottom
- Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling. Refer to [»4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling«, page 267](#)

## 4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling



### Caution

- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to [»1 Safety Precautions when Working on Charge Air System And Turbocharger«, page 241](#)
- ◆ Pay attention to the guidelines for clean working conditions. Refer to [»2 Guidelines for Clean Working Conditions«, page 242](#).

Always pay attention to these instructions before and during work.

### Disassemble

#### Version with Positioning Tab

- Press the connector coupling on the connecting hose -arrow 1- together.

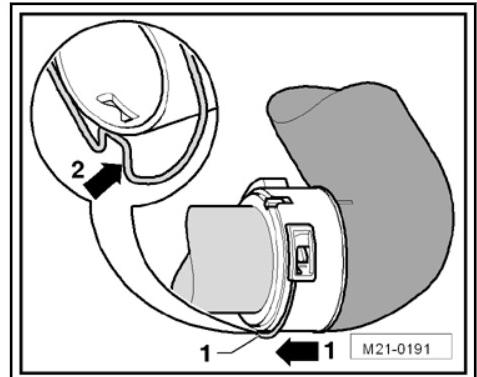


#### Note

The clamp -1- can only be completely engaged when the connector coupling is pressed together.

- Bring the clamp in direction of -arrow 2- into the release position.
- Disconnect the connector coupling without using tools.

#### Version without Positioning Tab





- Release the connector coupling by pulling the clip -1-. Remove the hose/pipe -2- without using a tool.

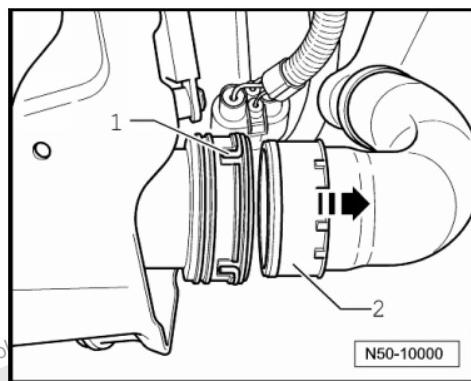
#### Assembly:

##### Version with Positioning Tab



##### Caution

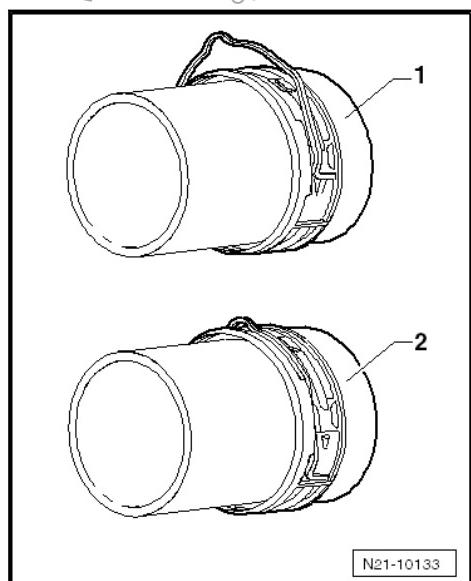
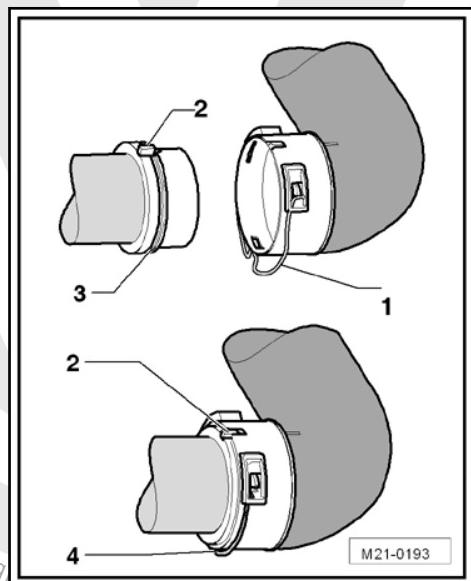
*The connector coupling sealing ring can be damaged if the clamp is in locked position when installing. This would result in a leak. Follow the assembly instructions.*



- Clean the sealing surfaces in the connector coupling.
- When replacing the seal, lay the seal in the groove of the connecting hose. Ensure gasket is completely seated in groove all the way around.
- Lightly oil the sealing surfaces and the seal.
- Bring the clamp -1- into the release position.
- Slide the connecting hose all the way into the clutch. Pay attention to the positioning tab -2- while doing this.
- Bring the clamp into the locked position -4-. During this, the clamp engages in the groove -3-.
- Then press in the connecting hose again.
- Check that the connector coupling is correctly positioned and locked by pulling on the connecting hose.

##### Version without Positioning Tab

- When replacing sealing ring, lay ring in charge air hose groove. Ensure gasket is completely seated in groove all the way around.
- Oil the sealing surfaces and the gasket.
- Bring the clip into the release position -1-.
- Slide the charge air hose into clutch until it stops.
- Bring the clip into the lock position -2- and then press the charge air hose back again.
- Check for correct seating and proper locking of connector by pulling on the hose.





## 4.4 Charge Air System, Checking for Leaks

Special tools and workshop equipment required

- ◆ Turbo System Tester Kit - VAG1687- with Turbo System Tester Kit - Adapter 10 - VAG1687/10-
- ◆ Ultrasonic Tester - VAG1842- or commercially available leak detection spray



### Caution

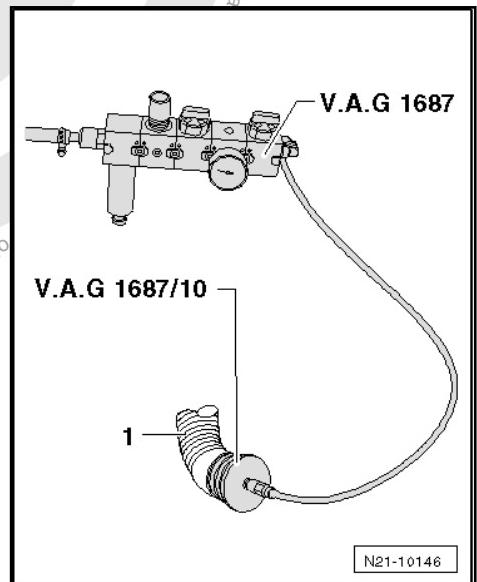
- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ["1 Safety Precautions when Working on Charge Air System And Turbocharger", page 241](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 242](#).

*Always pay attention to these instructions before and during work.*

### Test Sequence

- Remove the intake hose -1- from the Mass Airflow Sensor - G70-. Loosen the spring clamps using the -VAS6362- .
- Insert the -VAG1687/1- in the intake hose -1- and secure it with a clamp.

Prepare the -VAG1687- as follows:

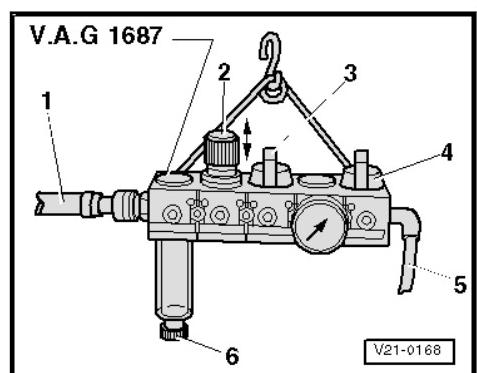


- Fully turn out the pressure regulator valve -2- to the closed position and close valves -3 and 4-.



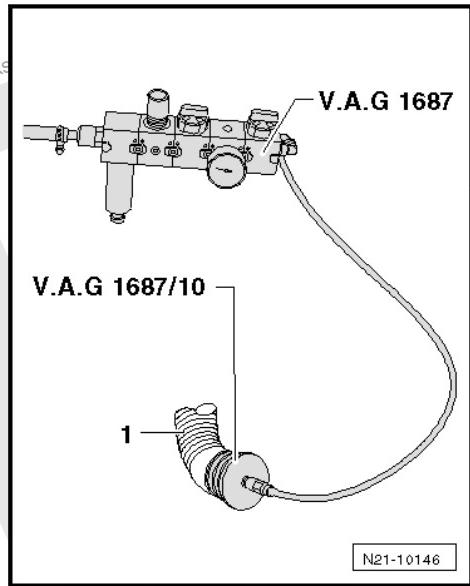
### Note

*The rotary knob must be pulled upward -arrow- so that the pressure regulator valve -2- can be turned.*





- Connect the -VAG1687- to the -VAG1687/10- as shown.





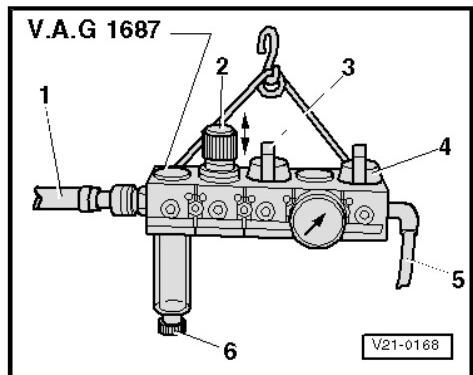
- Connect the pressure hose -1- (pressurized air supply) to the -VAG1687- .



#### Note

*If water is located in viewing glass, drain it via the water drain plug -6-.*

- Open the valve -3-.
- Set pressure to 0.5 bar (7.2 psi) using the pressure regulator valve -2-.



#### Caution

*The pressure must not exceed 0.5 bar (7.2 psi)! A pressure set too high may damage the engine.*

- Open the valve -4- and wait until the test circuit is filled. Adjust the pressure to 0.5 bar (7.2 psi) if necessary.
- Check the charge air system for leaks by listening, feeling and using a commercially available leak detection spray or using the -VAG1842S- .



#### Note

- ◆ Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling. Refer to ["4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling", page 267](#)
- ◆ Small leaks on the intake side of the turbocharger are permitted because the intake hoses are not designed for positive pressure.
- ◆ A small quantity of air dissipates via the valves in the engine. For this reason a pressure retention test is not possible.
- ◆ Information on the -VAG1842S- . Refer to the Operating Instructions.
- ◆ If a poorly sealed area is discovered, observe the notes for charge air system when repairing. Refer to ["4 Charge Air System", page 264](#) .
- ◆ Before removing the adapter, discharge the pressure in testing circuit by pulling off the coupling from the -VAG1687/10- .

## 4.5 Vacuum Hose Connection Diagram



#### Caution

*When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.*



### 1 - Vacuum Diaphragm

- On the turbocharger
- With the Charge Air Pressure Actuator Position Sensor - G581
- Removing and installing. Refer to ["3.5 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581, Replacing", page 256](#).

### 2 - Wastegate Bypass Regulator Valve - N75-

### 3 - From Brake Booster

### 4 - To the Vacuum Pump

### 5 - Connecting Piece

- At the vacuum pump

### 6 - Check Valve

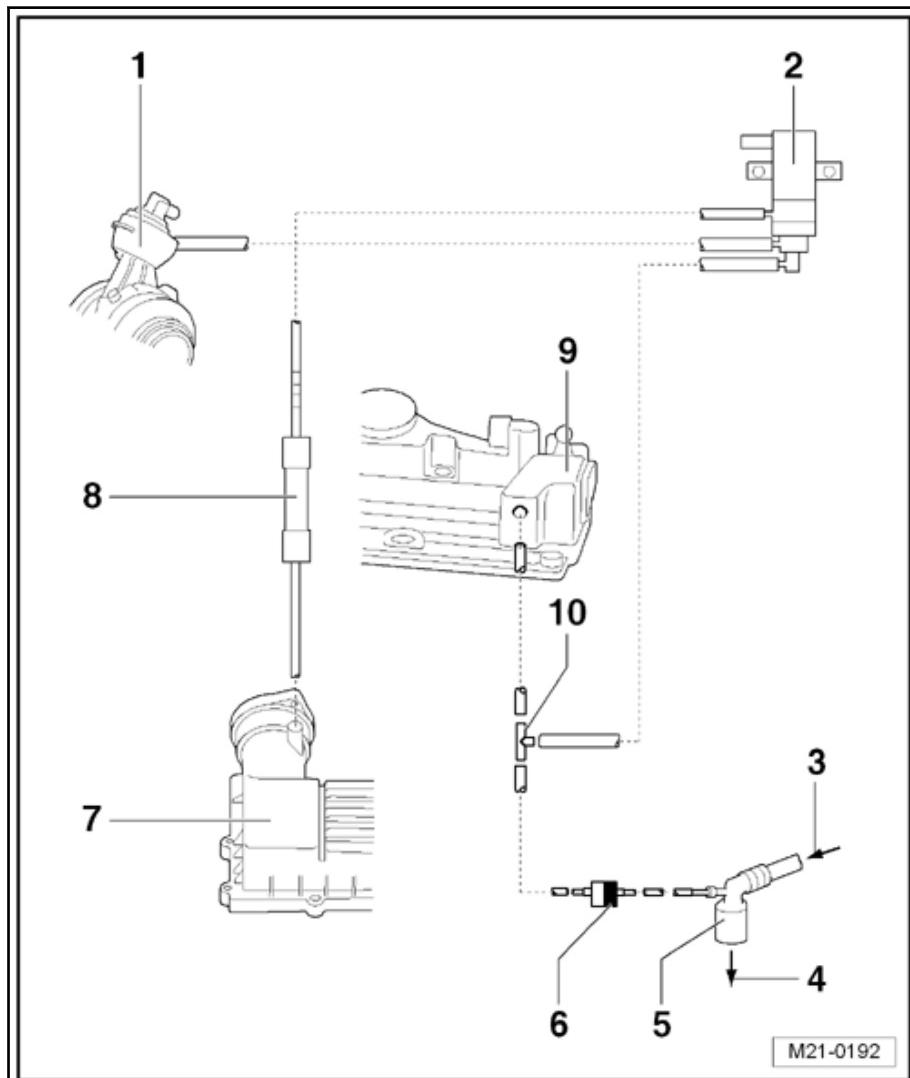
- Pay attention to the installed position: the white connection faces the junction piece  
-Item 10- [Item 10 \(page 272\)](#)
- Checking. Refer to ["4.7 Vacuum System, Checking", page 273](#), Vacuum System, Checking

### 7 - Air Filter

### 8 - Muffler

### 9 - Cylinder Head Cover

### 10 - Junction Piece



M21-0192

## 4.6 Vacuum Hose Connection Diagram, Engine Codes CBDA, CBDB, CEGA



### Caution

*When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.*



### 1 - Vacuum diaphragm

- On the turbocharger
- With the Charge Air Pressure Actuator Position Sensor - G581-
- Removing and installing. Refer to ["3.5 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581, Replacing", page 256](#).

### 2 - Wastegate Bypass Regulator Valve - N75-

3 - Muffler

4 - Air Filter

5 - To the Brake Booster

6 - Connecting Piece

- At the vacuum pump

7 - Check Valve

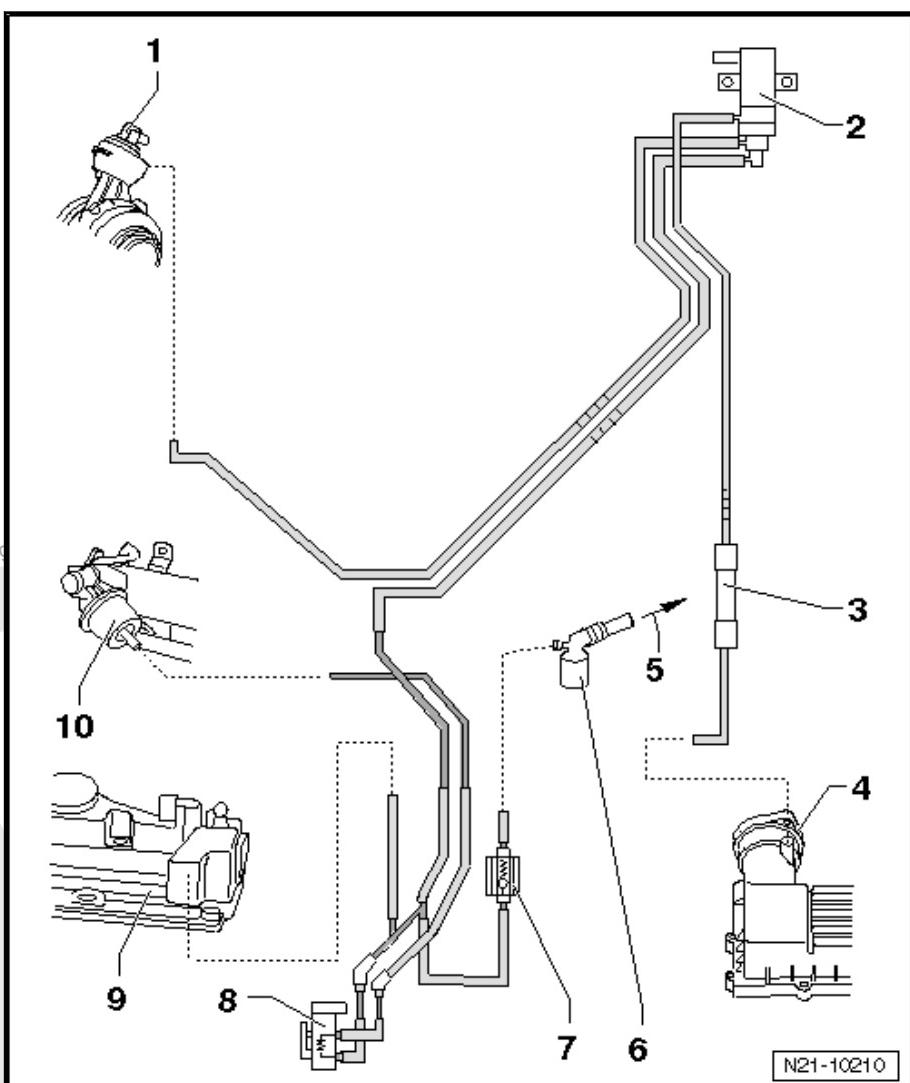
- Note the installation position

8 - EGR Cooler Switch-Over Valve - N345-

9 - Cylinder Head Cover

10 - Vacuum Diaphragm

- For the EGR cooler change over



## 4.7 Vacuum System, Checking

⇒ ["4.7.1 Supply Line and Check Valve, Checking", page 273](#)

⇒ ["4.7.2 Control Line to Turbocharger, Checking", page 275](#).

### 4.7.1 Supply Line and Check Valve, Checking

Special tools and workshop equipment required

- ◆ Hand Vacuum Pump - VAS6213-



### Caution

- ◆ When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.
- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ["1 Safety Precautions when Working on Charge Air System And Turbocharger", page 241](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 242](#).

Always pay attention to these instructions before and during work.

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).

Remove the vacuum hose on the lower connection from the Wastegate Bypass Regulator Valve - N75- -arrow in II-.

- Seal the open hose end with a suitable blind plug.



### Note

Do not use threaded bolts or pins.

- Disconnect the vacuum hose -arrow- at the vacuum pump connecting piece.
- Connect the - VAS6213- to the removed hose and generate a vacuum pressure of 0.6 bar (8.7 psi).
- Watch the pressure gauge on the -VAS6213- for approximately 30 seconds.
- The vacuum must not drop.

If vacuum drops:

- Replace the hose piece if there is damage or leaks in the hose line connection.

If the vacuum does not decrease:

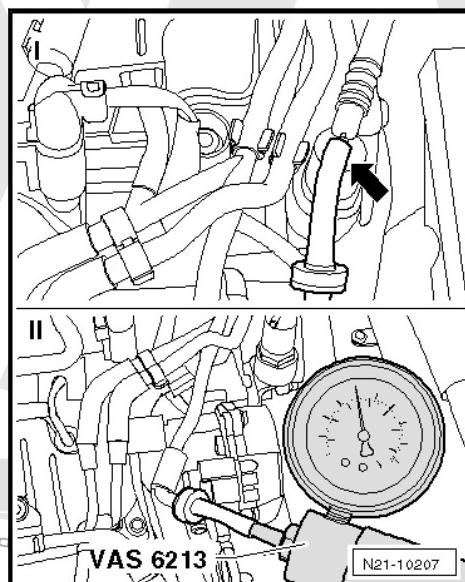
- First disconnect the hose at the - VAS6213- .
- Remove the blind plug from the hose end.
- If the check valve -Item 6- ["Item 6 \(page 272\)"](#) functions, a noticeable hissing can be heard as the vacuum pressure reduces.

If there is not a hissing sound:

- Replace the check valve -Item 6- ["Item 6 \(page 272\)"](#) .

If there is a hissing sound:

- Connect all the vacuum hoses.
- Check the control line to the turbocharger. Refer to ["4.7.2 Control Line to Turbocharger, Checking", page 275](#) .





## 4.7.2 Control Line to Turbocharger, Checking

Special tools and workshop equipment required

- ◆ Hand Vacuum Pump - VAS6213-



### Caution

- ◆ When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.
- ◆ Follow the safety precautions when working on the charge air system and turbocharger. Refer to ["1 Safety Precautions when Working on Charge Air System And Turbocharger", page 241](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 242](#).

Always pay attention to these instructions before and during work.

- Remove the vacuum hose at the center connection of the Wastegate Bypass Regulator Valve - N75- -Item 2- [⇒ Item 2 \(page 272\)](#) as well as at the turbocharger vacuum dia-phragm -Item 1- [⇒ Item 1 \(page 272\)](#).
- Seal an open end of the hose with a suitable blind plug.



### Note

Do not use threaded bolts or pins.

- Connect the - VAS6213- to the other end of the hose and generate a vacuum of 0.6 bar (8.7 psi).
- Watch the pressure gauge on the - VAS6213- for approximately 30 seconds.

- The vacuum must not drop.

If vacuum drops:

- Replace the vacuum hose.
- Connect all the vacuum hoses.
- Install the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).

If the vacuum does not decrease:

- Connect all the vacuum hoses.
- Install the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).



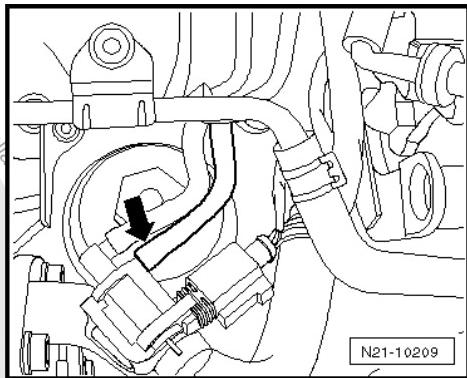
#### 4.7.3 Control Line to EGR Cooler Switch-Over Vacuum Diaphragm, Checking, Engine Codes CBDA, CBDB, CEGA

- Remove the hose at the center connection of the EGR Cooler Switch-Over Valve - N345- -arrow-.
- Connect the - VAS6213- to the removed hose and generate a vacuum pressure of 0.6 bar (8.7 psi).
- Watch the pressure gauge on the hand vacuum pump for approximately 30 seconds. The vacuum must not drop.

If the pressure drops:

- Remove the vacuum hose on the vacuum diaphragm for the EGR cooler switch-over.

Connect the - VAS6213- with the supplied test hose to the vacuum diaphragm and create a pressure of 0.6 bar (8.7 psi).



##### Note

- ◆ The adjusting travel of the vacuum diaphragm must be recognizable and the vacuum must not drop. If it is not, replace the EGR cooler. Refer to .
- ◆ If a fault is not identified at the vacuum diaphragm, replace the vacuum line on the EGR Cooler Switch-Over Valve - N345- .
- ◆ Install the engine cover. Refer to [“1.6 Engine Cover, Removing and Installing”, page 87](#).



## 23 – Diesel Fuel Injection

### 1 Safety Precautions when Working on Diesel Direct Fuel Injection Sys- tem



#### WARNING

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ Route all lines and wires in their original locations.
- ◆
- ◆ For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.
- ◆ Make sure that there is sufficient clearance to all moving or hot components.



#### DANGER!

*When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.*

- ◆ The fuel or fuel lines in fuel system can become very hot (danger of scalding)!
- ◆ Always wear protective eyewear, safety gloves and protective clothing when performing any work on the fuel system to avoid eye injuries and burns.
- ◆ In addition, the fuel system is under pressure! Before opening the system, place rags around the connection area and release pressure by carefully loosening the connection!
- ◆ If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to ⇒ “[3.10 Fuel System, Filling/Bleeding](#)”, page [304](#). (Running the high pressure fuel pump when dry must always be avoided).



#### WARNING

- ◆ Any type of fuel leak will result in an increased risk of fire.
- ◆ Do not turn on the ignition, open the front doors, or attempt to start the engine at any time while any part of the vehicle's fuel system is unassembled. Failing to heed this warning could result in fire and personal injury

If Testing Equipment Is Required during a Road Test, Note the Following:

- ◆ Test and measuring instruments must be secured to rear seat and operated by a second person from this location.



If the vehicle is involved in a collision while testing and measuring equipment is operated from the front passenger seat, the person sitting in that seat could be seriously injured when the airbag deploys.

**To Reduce the Risk of Personal Injury and/or Damage to the Fuel Injection and Glow Plug System, Always Observe the Following:**

- ◆ Only disconnect and reconnect wires for glow plug and fuel injection systems, including test leads, when the ignition is switched off.
- ◆ The Battery - A- may only be disconnected and connected when the ignition is switched off, otherwise it could damage the Engine Control Module - J623- .
- Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .





## 2 Guidelines for Clean Working Conditions

**When Working on the Fuel Supply/Injection System, Pay Careful Attention to the Following “7 rules” of Cleanliness:**

- ◆ Thoroughly clean the connection points and the surrounding area before loosening.
- ◆ Place the removed parts on a clean surface and cover them. Only use lint-free cloths.
- ◆ Carefully cover or seal opened components if the repair is not performed immediately.
- ◆ Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use parts that have been loosely stored or unpackaged (for example, in tool boxes etc.).
- ◆ Transport and protective packaging and sealing caps are to be removed only immediately prior to installation.
- ◆ When the fuel system is open: avoid working with compressed air if possible. Do not move the vehicle if possible.
- ◆ In addition, do not let diesel fuel flow onto the coolant hoses. If necessary, the hoses must be cleaned again immediately. Replace corroded hoses.



### 3 Diesel Direct Injection System

- ⇒ “3.1 General Information”, page 280
- ⇒ “3.2 Overview - Fuel System”, page 281
- ⇒ “3.3 Overview - Fuel System”, page 285
- ⇒ “3.4 Fuel Rail, Removing and Installing”, page 289
- ⇒ “3.5 Fuel Injector (Piezo Injector), Removing and Installing and High Pressure Lines, Installing”, page 292
- ⇒ “3.6 Fuel Pressure Regulator Valve N276 , Checking”, page 297
- ⇒ “3.7 Fuel Pressure Regulator Valve N276 , Removing and Installing”, page 298
- ⇒ “3.8 Fuel Pressure Sensor G247 , Removing and Installing”, page 300
- ⇒ “3.9 High Pressure Fuel Pump, Removing and Installing”, page 301
- ⇒ “3.10 Fuel System, Filling/Bleeding”, page 304
- ⇒ “3.11 Fuel System, Performing Leak Test”, page 305
- ⇒ “3.12 Pressure Retaining Valve in Fuel Return, Checking”, page 306
- ⇒ “3.13 Overview - Intake Manifold with Attachments”, page 307
- ⇒ “3.14 Intake Manifold, Removing and Installing”, page 309
- ⇒ “3.15 Overview - Air Filter”, page 311
- ⇒ “3.16 Air Filter Housing, Removing and Installing”, page 315
- ⇒ “3.17 Air Filter Element, Removing and Installing”, page 316
- ⇒ “3.18 Intake Air Pre-Heating Change-Over Valve, Checking”, page 318
- ⇒ “3.19 Intake Air Pre-Heating Change-Over Valve, Removing and Installing”, page 319
- ⇒ “3.20 Mass Airflow Sensor G70 , Removing and Installing”, page 320

#### 3.1 General Information



##### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 277 .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 279 .

Always pay attention to these instructions before and during work.



### Note

The Engine Control Module - J623- is equipped with a DTC memory. Before and after repairs or adjustments, the DTC memory must be checked. Refer to Vehicle Diagnostic Tester in "Guided Functions".

## 3.2 Overview - Fuel System

⇒ ["3.2.1 Overview - Fuel System, Engine Codes CBEA, CJAA", page 281](#)

### 3.2.1 Overview - Fuel System, Engine Codes CBEA, CJAA



#### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ ["2 Guidelines for Clean Working Conditions", page 279](#).
- ◆ If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to ⇒ ["3.10 Fuel System, Filling/Bleeding", page 304](#). (Never let the high pressure pump run dry).

Always pay attention to these instructions before and during work.





**1 - Fuel Metering Valve - N290-**

- Do not open

**2 - High Pressure Fuel Pump**

- Removing and installing. Refer to ["3.9 High Pressure Fuel Pump, Removing and Installing", page 301](#).
- The fuel system "must" always be filled after replacing (never run dry) (refer to ["3.10 Fuel System, Filling/Bleeding", page 304](#)), Fuel System, Filling.

**3 - Fuel Pressure Sensor - G247-**

- Removing and installing. Refer to ["3.8 Fuel Pressure Sensor G247 , Removing and Installing", page 300](#).

**4 - Rail Element (High Pressure Reservoir)**

**5 - Fuel Pressure Regulator Valve - N276- , 80 Nm**

- Removing and installing. Refer to ["3.7 Fuel Pressure Regulator Valve N276 , Removing and Installing", page 298](#).

**6 - Fuel Pressure Regulator Valve - N276-**

- Cannot be used again
- Remove and install using the Tool Insert AF 30 - T10553- .
- Removing and Installing. Refer to ["3.7 Fuel Pressure Regulator Valve N276 , Removing and Installing", page 298](#) .
- 80 Nm

**7 - Fuel Rail (High Pressure Reservoir)**

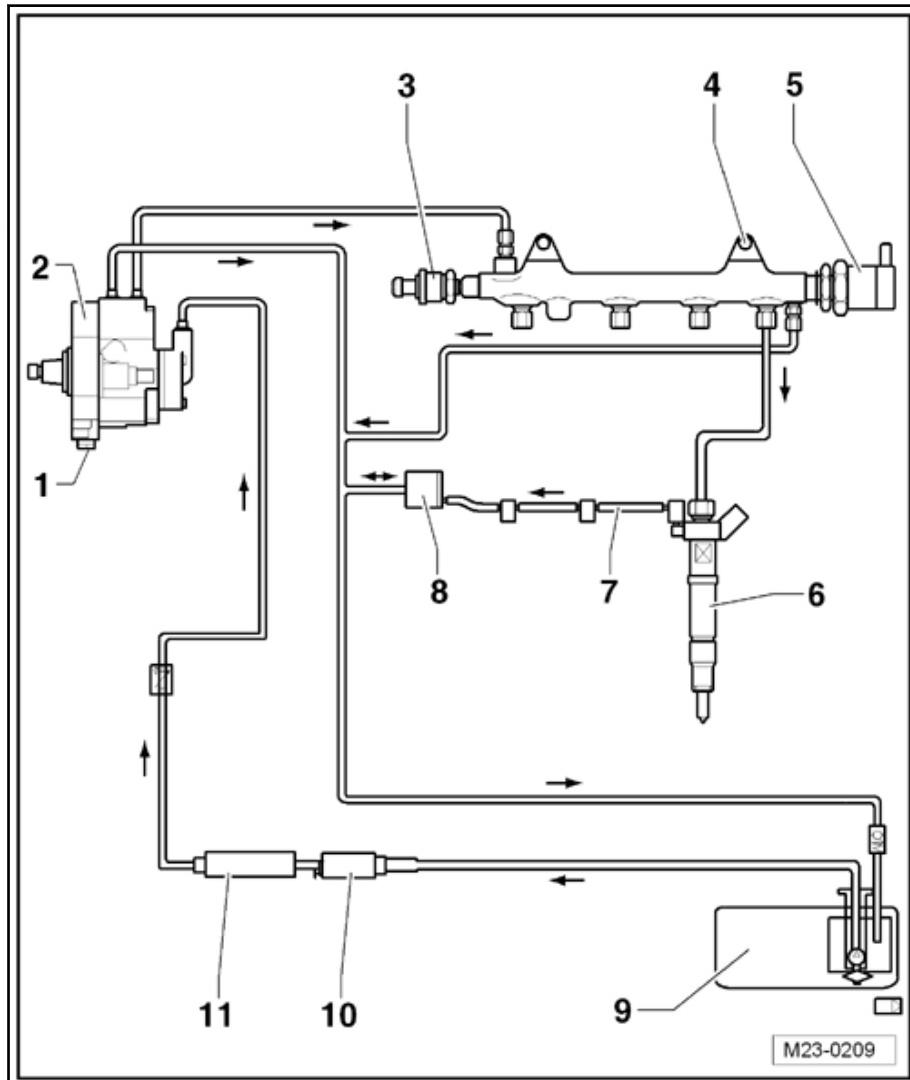
- Removing and Installing. Refer to ["3.4 Fuel Rail, Removing and Installing", page 289](#) .

**8 - Pressure Retaining Valve**

- The check valve always maintains a residual pressure (control quantity) of approximately 10 bar (145.03 psi) in the fuel return lines.
- The fuel injectors require this control quantity to function correctly.
- The pressure retaining valve must be replaced completely with the fuel return lines -Item 7- ["Item 7 \(page 282\)"](#) .
- The engine must run at idle for approximately two minutes after replacing to bleed the fuel system.
- Pressure Retention Valve in Fuel Return Line, Checking. Refer to ["3.12 Pressure Retaining Valve in Fuel Return, Checking", page 306](#) .

**9 - Fuel Tank**

- Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011. Refer to ["4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011", page 209](#)





- Overview - Fuel Tank, Jetta from MY 2011 Only. Refer to [“4.3 Overview - Fuel Tank, Jetta from MY 2011 Only”, page 211](#)

## 10 - Fuel Filter

- Overview - Fuel Filter. Refer to [“6.2 Overview - Fuel Filter”, page 227](#).

## 11 - Auxiliary Fuel Pump - V393-

- Removing and installing. Refer to [“6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing”, page 236](#).

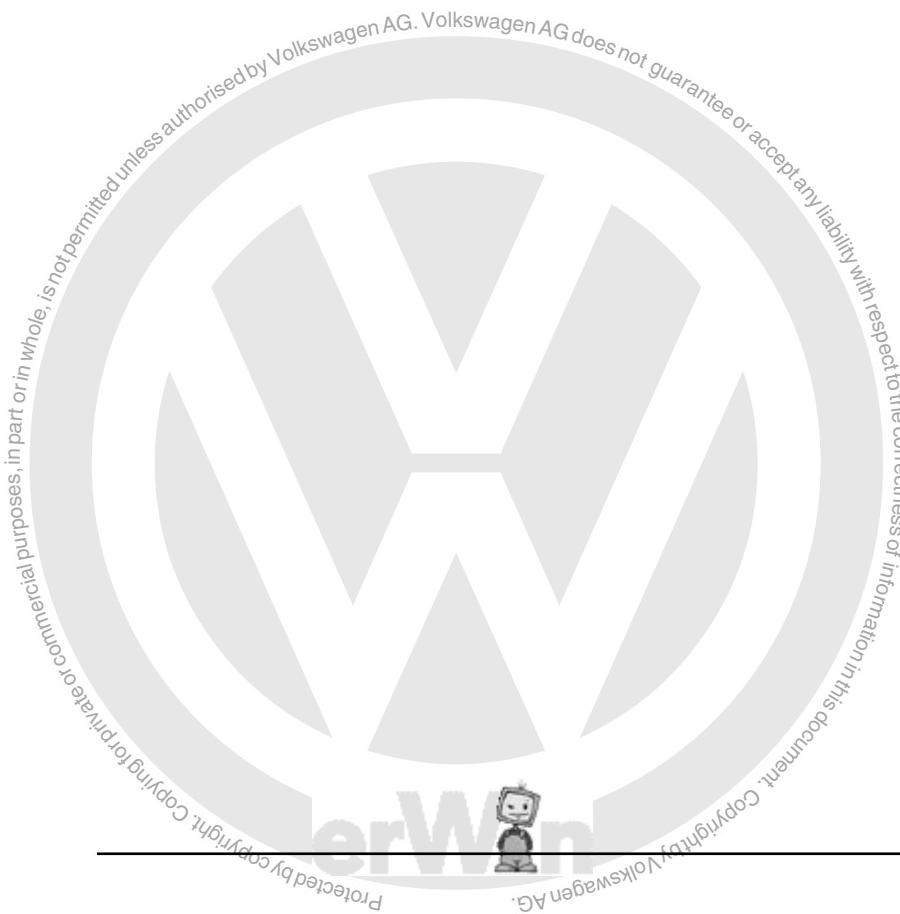
### 3.2.2 System Overview - Engine Codes CBDA, CBDB, CEGA



#### DANGER!

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to [“1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 277](#).*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to [“2 Guidelines for Clean Working Conditions”, page 279](#).*
- ◆ *If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to [“3.10 Fuel System, Filling/Bleeding”, page 304](#). (Never let the high pressure pump run dry).*

*Always pay attention to these instructions before and during work.*





### 1 - Fuel Tank

- With the Transfer Fuel Pump - G6-

### 2 - Fuel Filter

- With pre-warm valve
- Overview - Fuel Filter. Refer to ["6.2 Overview - Fuel Filter", page 227](#).
- Removing and installing. Refer to ["6.3 Fuel Filter, Removing and Installing", page 229](#).

### 3 - Auxiliary Fuel Pump - V393-

Removing and installing. Refer to ["6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing", page 236](#).

### 4 - Filter

### 5 - Fuel Temperature Sensor - G81-

### 6 - High Pressure Pump

- After replacing, the fuel tank must be filled (never run dry). Refer to ["3.10 Fuel System, Filling/Bleeding", page 304](#).
- Removing and installing. Refer to ["3.9 High Pressure Fuel Pump, Removing and Installing", page 301](#).

### 7 - Fuel Metering Valve - N290-

- Must not be removed

### 8 - Fuel Pressure Regulator Valve - N276-

- Removing and installing. Refer to ["3.7 Fuel Pressure Regulator Valve N276 , Removing and Installing", page 298](#).

### 9 - High Pressure Reservoir (Rail)

### 10 - Fuel Pressure Sensor - G247-

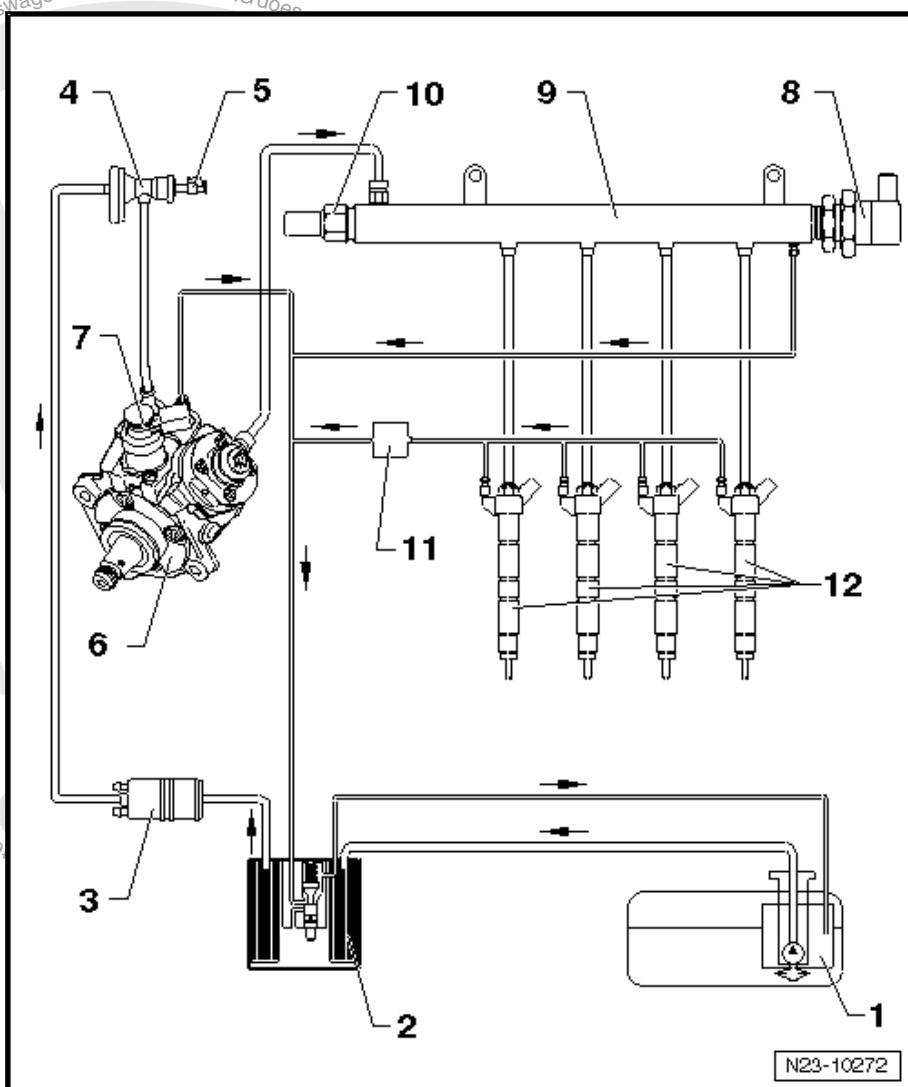
- Removing and installing. Refer to ["3.8 Fuel Pressure Sensor G247 , Removing and Installing", page 300](#).

### 11 - Pressure Retaining Valve

- The pressure retaining valve always maintains a residual pressure (control quantity) of approximately 10 bar (145.03 psi) in the fuel return lines.
- The Piezo injectors need this control quantity for their function.
- The pressure retaining valve can be replaced only with the complete fuel return lines.
- The engine must run at idle for approximately two minutes after replacing to bleed the fuel system.
- Check the pressure retaining valve. Refer to ["3.12 Pressure Retaining Valve in Fuel Return, Checking", page 306](#).

### 12 - Fuel Injector (Piezo Injectors)

- Cylinder 1 Fuel Injector - N30-





- Cylinder 2 Fuel Injector - N31-
- Cylinder 3 Fuel Injector - N32-
- Cylinder 4 Fuel Injector - N33-
- Removing and installing. Refer to ["3.5 Fuel Injector \(Piezo Injector\), Removing and Installing and High Pressure Lines, Installing", page 292](#).

### 3.3 Overview - Fuel System

#### Special tools and workshop equipment required

- ◆ Hose Clip Pliers - VAS6362-



##### Note

- ◆ Hose connections are secured with spring clips.
- ◆ To assemble the spring clips, it is recommended to use Hose Clip Pliers - VAS6362- or Hose Clip Pliers - VAS 6340- .



##### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).

Always pay attention to these instructions before and during work.



##### Caution

Follow the points below to avoid running the high pressure fuel pump dry and to start the engine quickly after replacing the components:

- ◆ If the fuel system components between the fuel tank and the high pressure fuel pump are removed or replaced,
- ◆ the basic setting "transfer fuel pump test" must be performed to vent the fuel system.
- ◆ If a fuel pump, fuel line (between the fuel tank and the high pressure fuel pump) or fuel filter is removed or replaced,
- ◆ the "transfer fuel pump test" basic setting must be performed »1 time« before starting the engine for the first time.
- ◆ If the high pressure fuel pump was removed or replaced, the "check the transfer fuel pump" basic setting must be performed »three times« before starting the engine for the first time.
- ◆ Fill the fuel tank after installing the high pressure pump. Refer to ["3.10 Fuel System, Filling/Bleeding", page 304](#).



## 1 - Protective Strip

- For the rail element (high pressure reservoir) -Item 7- [⇒ Item 7 \(page 287\)](#) and high pressure lines -Item 5- [⇒ Item 5 \(page 286\)](#)

## 2 - Fuel Return Lines

- With pressure retaining valve -Item 8- [⇒ Item 8 \(page 282\)](#)
- The fuel return line must be routed correctly. They may be replaced only with the pressure retaining valve.
- Run the engine at idle for approximately two minutes after replacing to bleed the fuel system and then check the fuel return lines for leaks.
- Pressure Retention Valve in Fuel Return Line, Checking. Refer to [“3.12 Pressure Retaining Valve in Fuel Return, Checking”](#), page 306 .

## 3 - Bolt

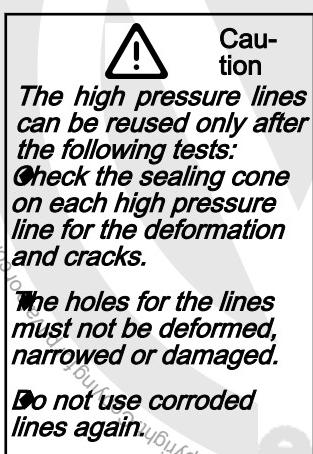
- 8 Nm

## 4 - Fuel Return Line

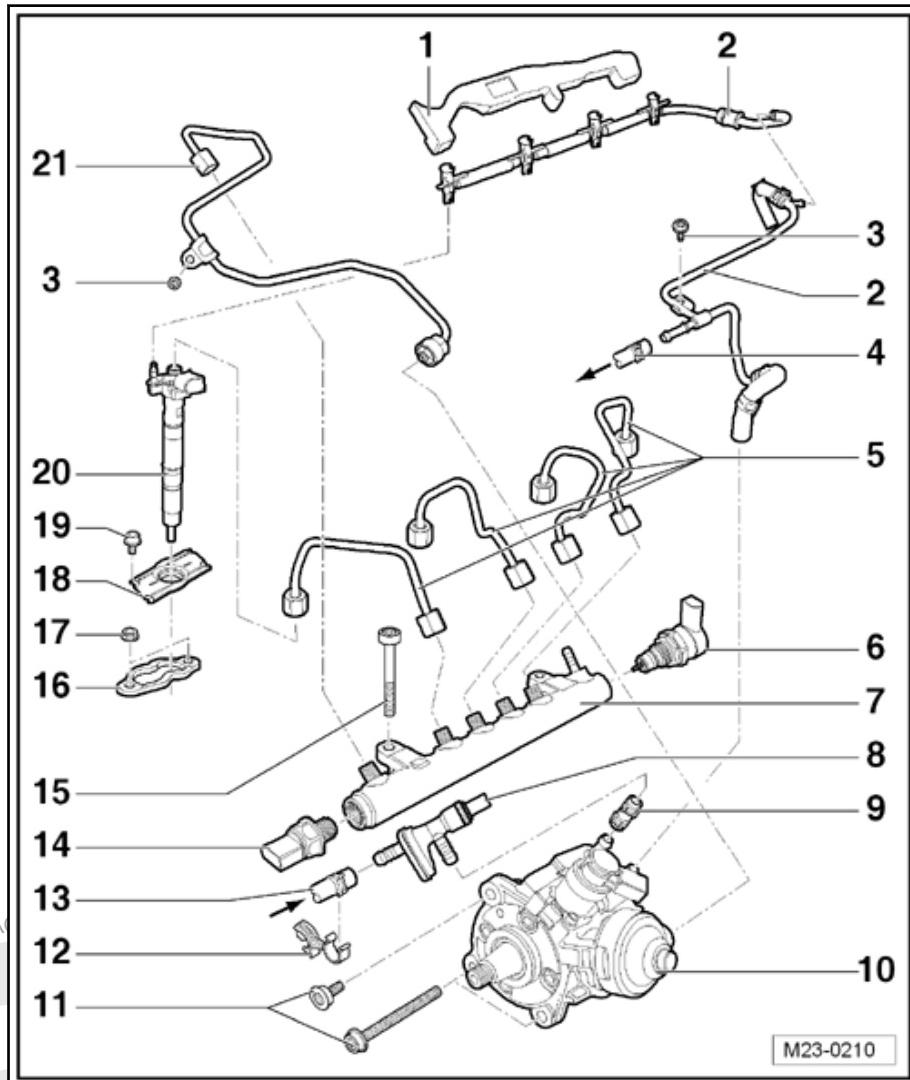
- Blue or with blue markings
- Check for secure fit
- From fuel filter -Item 7- [⇒ Item 7 \(page 228\)](#)

## 5 - High Pressure Lines

- 28 Nm
- Between the rail element (high pressure reservoir) -Item 7- [⇒ Item 7 \(page 287\)](#) and fuel injector -Item 20- [⇒ Item 20 \(page 287\)](#)



- Do not interchange
- When installing, the fuel injectors -Item 20- [⇒ Item 20 \(page 287\)](#) and high pressure lines may only be installed on the same cylinder as before.





- Do not change the angles of the high pressure lines
- Install without tension

#### 6 - Fuel Pressure Regulator Valve - N276- , 80 Nm

- Removing and installing. Refer to [“3.7 Fuel Pressure Regulator Valve N276 , Removing and Installing”, page 298](#).

#### 7 - Rail Element (High Pressure Reservoir)

#### 8 - Fuel Temperature Sensor - G81-

#### 9 - Fuel Supply Line

- Check for secure fit
- Between the Fuel Temperature Sensor - G81- -Item 8- [⇒ Item 8 \(page 287\)](#) and high pressure fuel pump -Item 10- [⇒ Item 10 \(page 287\)](#) .

#### 10 - High Pressure Fuel Pump

- With Fuel Metering Valve - N290- -Item 1- [⇒ Item 1 \(page 282\)](#)
- Removing and installing. Refer to [“3.9 High Pressure Fuel Pump, Removing and Installing”, page 301](#).
- The fuel system “must” always be filled after replacing (never run dry) (refer to [“3.10 Fuel System, Filling/Bleeding”, page 304](#) ), Fuel System, Filling.

#### 11 - Bolt

- 20 Nm

#### 12 - Bracket

- For the Fuel Temperature Sensor - G81- -Item 8- [⇒ Item 8 \(page 287\)](#)

#### 13 - Fuel Supply Line

- white or with white markings
- Check for secure fit
- From the Auxiliary Fuel Pump - V393-
- Auxiliary Fuel Pump - V393- , Removing and installing. Refer to [“6.6 Auxiliary Fuel Pump V393 \(Inline Fuel Pump\), Removing and Installing”, page 236](#)

#### 14 - Fuel Pressure Sensor - G247- , 100 Nm

- Removing and installing. Refer to [“3.8 Fuel Pressure Sensor G247 , Removing and Installing”, page 300](#).

#### 15 - Bolt

- 22 Nm

#### 16 - Tensioning Claw

- Always replace
- Note the installation position Refer to [Fig. “Tensioning Bracket Installation Position” , page 288](#) .

#### 17 - Nut

- 10 Nm

#### 18 - Fuel Injector Cover

- Replace if damaged

#### 19 - Bolt

- 5 Nm

#### 20 - Fuel Injector (Piezo Injector)

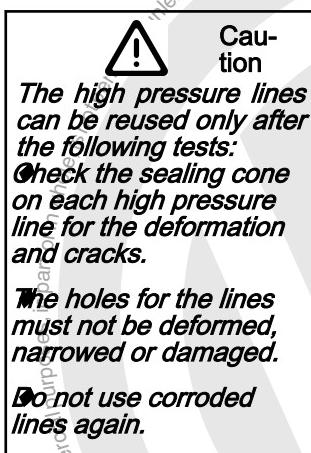
- The following components and seals and/or O-ring must be replaced at every removal and installation: “tension bracket”, “copper washer”, “fuel injection unit shaft O-ring” and “fuel injection return O-ring”.
- The following components and seals and/or O-ring must be replaced when replacing the fuel injection unit: “tensioning claw”, “fuel injection line”, “copper washer” “fuel injection unit shaft O-ring” “fuel injection unit return O-ring”
- When installing, the fuel injectors -Item 5- [⇒ Item 5 \(page 286\)](#) and high pressure lines may only be installed on the same cylinder as before.



- Removing and installing. Refer to [“3.5 Fuel Injector \(Piezo Injector\), Removing and Installing and High Pressure Lines, Installing”, page 292](#).

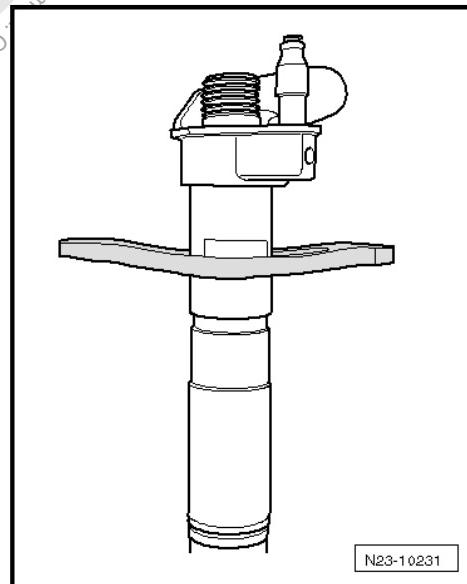
## 21 - High Pressure Line

- 28 Nm
- Between the high pressure fuel pump -Item 10- [⇒ Item 10 \(page 287\)](#) and rail element (high pressure reservoir) -Item 7- [⇒ Item 7 \(page 287\)](#)



- Do not bend the high pressure line to a different angle.
- Install without tension

### Tensioning Bracket Installation Position

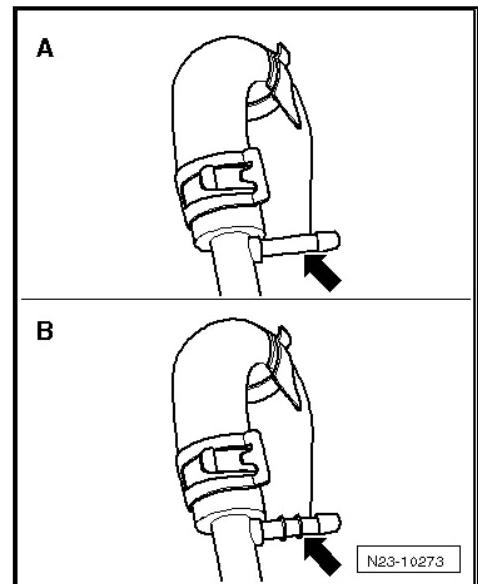




### Fuel Return Line Differences

-A-, No ribbing: for connecting the overflow oil line, use a clamp.  
 Refer to the Parts Catalog.

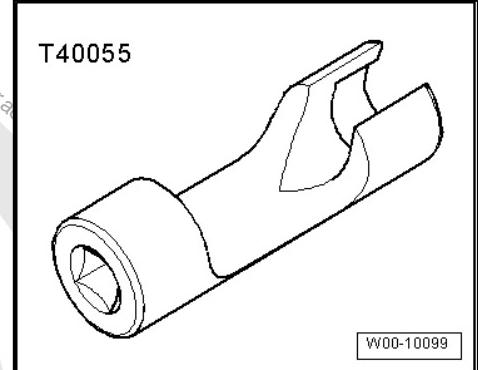
-B-, With ribbing: for connecting the overflow oil line, do NOT  
 use a clamp



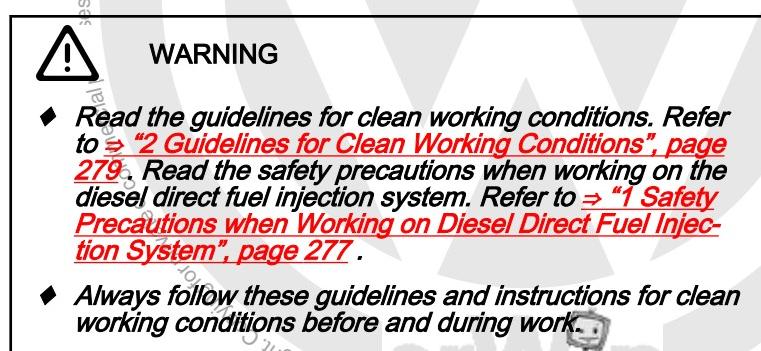
## 3.4 Fuel Rail, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench, 6-50Nm - VAG 1331A-
- ◆ Torque Wrench 1331 Insert - Reversible Ratchet - V.A.G 1331/1-
- ◆ Torque Wrench 1331 Insert - Open Jaw - 17mm - V.A.G 1331/6-
- ◆ Union Nut Socket - T40055



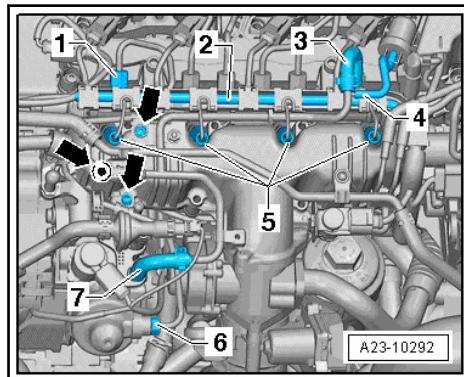
### Removing



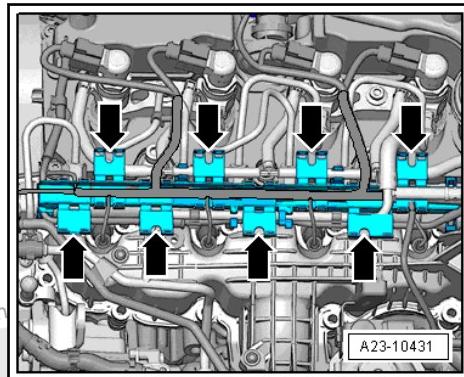
- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Remove the noise insulation from the cylinder head cover.



- Open the union nuts on the high pressure pump -6- and on the fuel rail -1- and remove the high fuel pressure line.
- Remove the screws -arrows- for the high fuel pressure line.
- Remove the fuel supply hose -3-.



- Open the clamps -arrows- and free up the wiring harness.



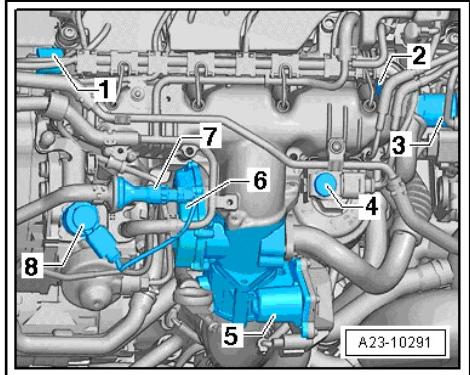


- Disconnect the following electrical connectors.
- 1 - Fuel Pressure Sensor - G247-
- 2 - Fuel Pressure Regulator Valve - N276-
- Fuel Injectors
- Glow Plugs



#### Caution

- ◆ *Mark the allocation of the high pressure lines on the cylinder. They may only be reinstalled on the same cylinder.*
- ◆ *Note the guidelines for clean working conditions on the injection system.*
- ◆ *Always seal any open connections with a suitable cover.*



- Remove the high pressure line union nuts on the fuel injectors using the 17 mm wrench Union Nut Socket - T40055- .
- Remove the high pressure line union nuts on the fuel rail using the Torque Wrench 1331 Insert - Open Jaw - 17mm - V.A.G 1331/6- .
- Place the removed high pressure lines on a clean cloth.
- Remove both screws and remove the fuel rail.

#### Installing

Install in reverse order of removal while noting the following:

- Install the high pressure lines without tension.



#### Note

- ◆ *When using the high pressure line again, pay attention to the cylinder identification.*
- ◆ *The high pressure lines can be reused only after the following tests:*
- ◆ *Check the sealing cone on each high pressure line for the deformation and cracks.*
- ◆ *The holes for the lines must not be deformed, narrowed or damaged.*
- ◆ *Do not use corroded lines again.*
- Tightening specifications. Refer to ["3.3 Overview - Fuel System", page 285](#) .



### 3.5 Fuel Injector (Piezo Injector), Removing and Installing and High Pressure Lines, Installing

⇒ “3.5.1 Fuel Injector (Piezo Injector), Removing and Installing”, page 292

⇒ “3.5.2 High Pressure Lines, Installing”, page 295

#### 3.5.1 Fuel Injector (Piezo Injector), Removing and Installing

##### Special tools and workshop equipment required

- ◆ Puller - Unit Injector - T10055- with Puller - Unit Injector Adapter 1 - T10055/1-
- ◆ O-Ring Assembly Sleeve - T10377-
- ◆ Union Nut Socket - T40055-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-



##### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 277 .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 279 .

Always pay attention to these instructions before and during work.



##### WARNING

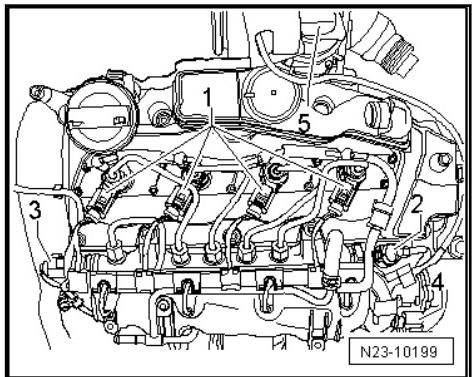
- ◆ You must remove the fuse for the fuel pump control module before starting any repairs of the vehicle's fuel system. Failing to do so could result in fire and personal injuries.
- ◆ Do not turn on the ignition, open the front doors, or attempt to start the engine at any time while any part of the vehicle's fuel system is unassembled. Failing to heed this warning could result in fire and personal injury

##### Removing:

- Follow all the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 279 .
- Remove the engine cover. Refer to ⇒ “1.6 Engine Cover, Removing and Installing”, page 87 .
- Remove the protective strip, if equipped -Item 1- ⇒ Item 1 (page 286) .
- Remove the noise insulation from the cylinder head cover.



- Disconnect the connector -1- from the fuel injectors to be removed.
- Before removing, dry the return line connection on the fuel injectors that will be removed (for example using a commercially available detergent).
- Dry the return line connection.
- Cover the return line connection with a rag.



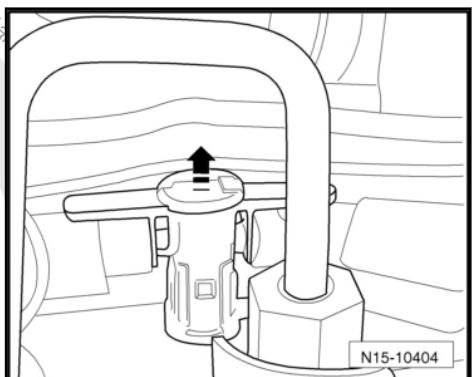
- Remove the fuel return line connections on the fuel injectors to be removed. Press the connection on the tab downward and pull the center piece upward to release.



#### Caution

*Pay attention to cleanliness. Dirt and contaminants must not get into the return lines and the connections on the fuel injector units.*

*Always protect all opened fuel connections to prevent dirt from getting into them.*



- Remove the high pressure line -Item 5- [⇒ Item 5 \(page 286\)](#) between the rail element (high pressure reservoir) and the fuel injectors to be removed.
- Remove the bolts in the cover -Item 18- [⇒ Item 18 \(page 287\)](#) on the fuel injectors to be removed.
- Raise the cover slightly and rotate it 90° to free up the fuel injector nuts.



#### Caution

*When removing the fuel injector nuts, the nut could fall into the cylinder head. Work very carefully to avoid unnecessary work or damage.*

- Remove the nuts from the corresponding fuel injector.

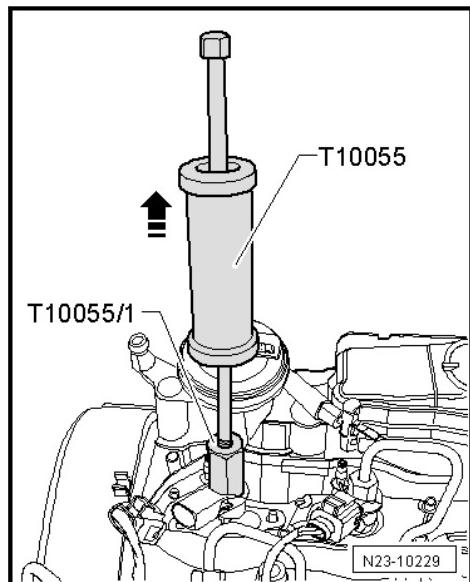


- Position the - T10055- with the -T10055/1- , as shown, and remove the fuel injector upward by tapping.

#### Installing:

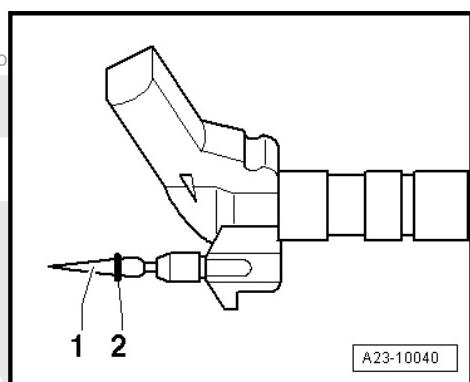
##### Important Instructions on Installing the Fuel Injectors:

- Using the Cleaning Set - VAS6811- , clean the empty fuel injector shafts and sealing surfaces in the cylinder head before installing the injectors. Refer to the Owner's Manual.
- The following components, seals and O-rings must be replaced each time a fuel injector is removed, and installed or replaced: "tension bracket", "copper washer", "O-ring for the fuel injector shaft" and the "O-ring for the fuel injector return".
- Fuel injection unit must be installed in the same cylinder.
- Check the fuel injectors and installation locations for contamination before assembling.
- The fuel injectors must not have any damage.
- Lubricate all of the O-rings with assembly oil or engine oil before installing.



##### If a Used Fuel Injector Is Installed Again:

- Spray the tip of the fuel injector with a rust removing spray. Remove the rust or oil particles with a rag after approximately five minutes.
- To remove the used copper gasket from the fuel injector, clamp the gasket carefully in a vise until the clamping jaws on the vise prevent the copper gasket from turning. Pull the fuel injector out of the copper gasket by hand with slight rotating and pulling motions.
- Use a plastic socket to install the copper gasket.
- To avoid damaging the O-ring, slide the new O-ring -2- for the fuel return connection over the assembly mandrel -1-.
- To remove rust particles on the fuel injector sealing surface, clean the fuel injector duct in the cylinder head with a cloth dampened with engine oil or rust remover. Do not damage the sealing flanges.



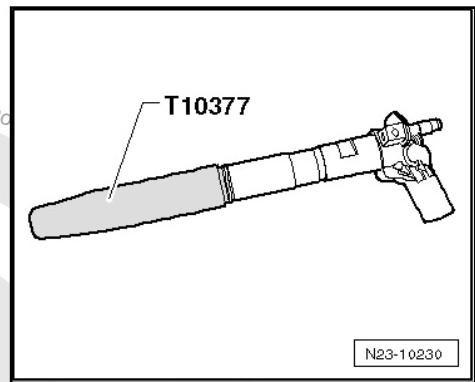


- Replace the fuel injector shaft seal using the - T10377- .
- Slide the fuel injector cover on.
- Slide the clamping bracket onto the fuel injector and make sure it is positioned correctly. Refer to [Fig. “Tensioning Bracket Installation Position”](#), page 288 .
- Insert the fuel injector in the fuel injector shaft.



**Caution**

*When installing the fuel injector nuts, the nut could fall into the cylinder head. Work very carefully to avoid unnecessary work or damage.*



N23-10230

- Mount the nuts on the tension bracket by hand and tighten them. Tightening specification -Item 17- [Item 17 \(page 287\)](#) .
- Turn the cover for the fuel injectors to its installed position and tighten it. Tightening specification -Item 19- [Item 19 \(page 287\)](#) .
- Install the high pressure lines. Refer to [“3.5.2 High Pressure Lines, Installing”](#), page 295 .

**After Replacing One or More Fuel Injectors:**

- ◆ Program the adaptation of the correction values for the new fuel injectors in the engine/motor control module. Refer to Vehicle Diagnostic Tester
- ◆ Reset the adaptation value for the Fuel Pressure Regulator Valve - N276- .
- ◆ [\[01 - Engine Electronics\]](#)
- ◆ [\[01 - Engine electronics, functions\]](#)
- ◆ [\[01 - Resetting engine management adaptation values\]](#)
- ◆ [\[Selection: Reset the metering unit and pressure regulating valve adaptation values.\]](#)

### 3.5.2 High Pressure Lines, Installing

**Special tools and workshop equipment required**

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Union Nut Socket - T40055-



**Caution**

*Loosen the rail and move it slightly. This makes it possible to mount the fuel injection line free of tension. The lines must not be bent or under stress. Long term this would cause the line to break.*



## Note

The following describes installing new fuel injection lines. If installing fuel injection lines, which were already removed, then be sure to check the points listed in -Item 5- [Item 5 \(page 286\)](#). The procedure is otherwise identical.

### Installing the Individual Fuel Injection Lines (Cylinder 1 through 4, between the Rail and Fuel Injector)

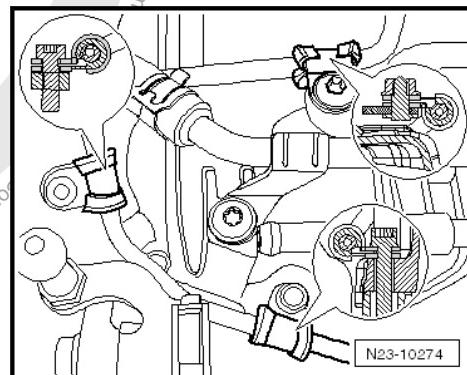
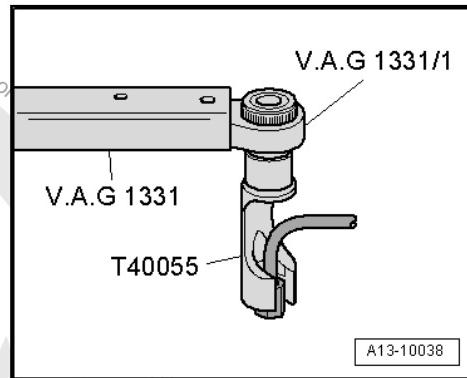
Tightening specifications. Refer to [“3.3 Overview - Fuel System”, page 285](#).

- Remove the new fuel injection line from the packaging, remove the plugs and place the line between the rail and injector immediately.
- First tighten the union nuts by hand on the fuel injection line without using tools. Make sure the line is installed correctly.
- Proceed the same way with the other fuel injection lines, if necessary.
- Tighten the rail, if necessary, again to the tightening specification.
- Tighten the union nuts on all the newly installed fuel injection lines to the tightening specification using -VAG1331- and -T40055- .

### Installing the Fuel Line (between the High Pressure Pump and the Rail) or the Entire Wiring Harness

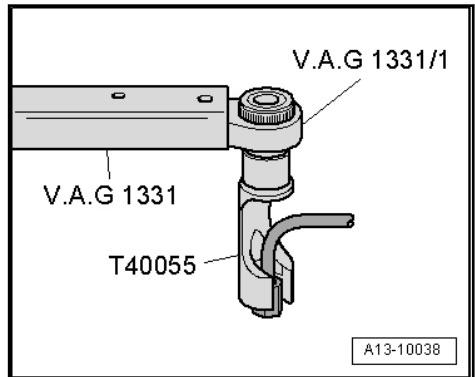
Tightening specifications. Refer to [“3.3 Overview - Fuel System”, page 285](#).

- Loosen the bolts on the Rail and make sure it is possible to move the rail, if this was not done before.
- Then remove the fuel line from its packaging, remove the plugs and position the line immediately between the high pressure pump and the rail.
- First tighten the union nuts by hand on the fuel injection line without using tools. Make sure the line is installed correctly.
- Proceed in the same way with the four fuel injection lines, if the entire wiring harness has to be installed.
- Install all three clamps over the fuel line. Make sure they are aligned.
- Install the clamp screws approximately 3 thread turns.
- Tighten the rail again.
- Tighten the top clamp on the intake manifold to 8 Nm.





- Tighten the union nuts on all the newly installed fuel injection lines to the tightening specification using -VAG1331- and -T40055- .
- Tighten the other two clamps to 8 Nm.
- Press the return line connections carefully over the sealing ring onto the injector (check the sealing ring first for damage). The connection must engage audibly. Then press the release pin down carefully.
- Fill the fuel system. Refer to ["3.10 Fuel System, Filling/Bleeding", page 304](#) .



### 3.6 Fuel Pressure Regulator Valve - N276-, Checking

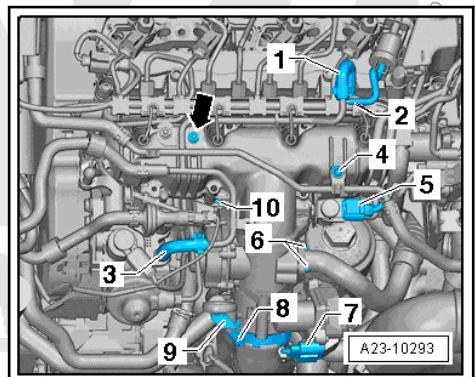


#### DANGER!

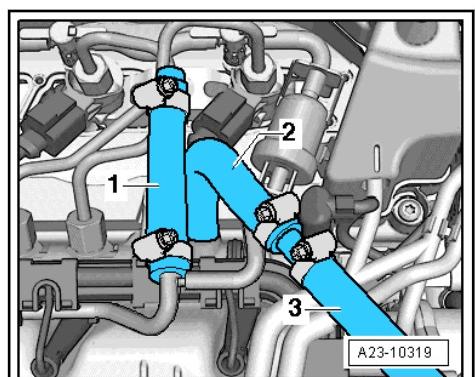
- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#) .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#) .

*Always pay attention to these instructions before and during work.*

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#) .
- Remove the noise insulation from the injectors.
- Disconnect the fuel return line -1-.



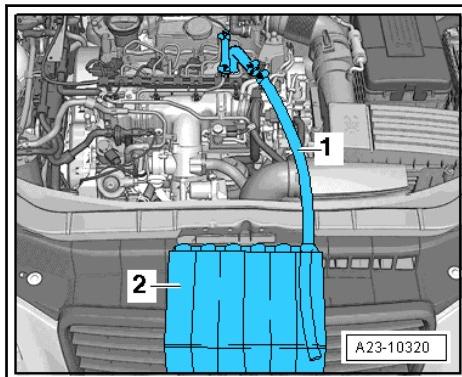
- Seal the open return line connection with a plug -1-.
- Connect the return line -2- with a hose -3-.





- Hold his hose -1- inside a suitable container -2- in order to measure the return quantity.
- Start engine and let it run at idle.
- Target value in 30 seconds: 90 to 110 ml (3.0 to 3.7 ounces).

If the specified value is not attained, then the fuel pressure regulator valve is faulty.



### 3.7 Fuel Pressure Regulator Valve - N276- , Removing and Installing

#### Function

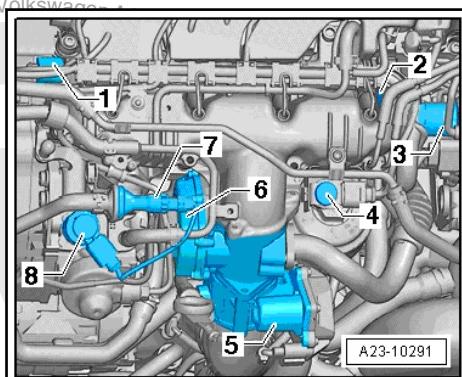
The Fuel Pressure Regulator Valve - N276- -2- is located inside the fuel rail and maintains a constant pressure inside the fuel rail and in the fuel injection lines (high pressure fuel circuit).

If the pressure in the high pressure fuel circuit is too high, the regulator valve will open so that some of the fuel flows from the fuel rail back into the fuel tank via a return line.

If the pressure in the high pressure fuel circuit is too low, the Fuel Pressure Regulator Valve - N276- closes and seals the high-pressure side from the low-pressure side.



*The Fuel Pressure Regulator Valve - N276- must always be replaced after removal.*



#### Special tools and workshop equipment required

- ◆ Torque Wrench, 40-200Nm - V.A.G 1332A-
- ◆ Tool Insert AF 30 - T10553-

#### Removing



#### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).
- ◆ Follow the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).

*Always pay attention to these instructions before and during work.*

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Remove the noise insulation from the cylinder head cover.
- Remove the fuel rail. Refer to ["3.4 Fuel Rail, Removing and Installing", page 289](#).



- Before removing, clean the threaded area around the Fuel Pressure Regulator Valve - N276- (for example using commercially available coolant). Contamination must not enter the bore in the rail element (high pressure reservoir).

 Note

*Clean carefully, cleaner must not enter the connector.*

- Dry the Fuel Pressure Regulator Valve - N276- .
- Loosen the union nut using the 30 mm Open End Wrench - T10553- by counterholding the housing hex fitting at the same time. Then remove it by hand.
- Suction any dirt out of the hole in the fuel rail, the threads and the sealing surface. Do not use mechanical tools.
- Close the open fuel rail connections using clean blind plugs.

 Note

*Seal the rail element bore immediately with a suitable plug to prevent contaminants from entering.*

### Installing

 Note

- ◆ *The Fuel Pressure Regulator Valve - N276- has a biting edge instead of a seal and therefore cannot be used again.*
- ◆ *Check the new Fuel Pressure Regulator Valve - N276- sealing surfaces (biting edge seal) and threads for damage.*
- ◆ *Check the sealing surface on the hole inside the fuel rail.*
- ◆ *Coat the biting edge of the threaded insert and the O-ring for the Fuel Pressure Regulator Valve - N276- with diesel fuel.*
- Tighten the union nut by hand.
- Align the new regulator valve so that the connection line is not taut after connecting the connector.
- Hold the regulator valve by the housing hex bolt in this position using an open-end wrench or with pliers.
- Tighten the union nut using the 30 mm Open End Wrench - T10553- by counterholding the housing hex fitting at the same time. Refer to [⇒ Item 6 \(page 287\)](#) .
- Install the fuel rail. Refer to [⇒ “3.4 Fuel Rail, Removing and Installing”, page 289](#) .
- After installing, let the engine run at a moderate speed for several minutes and then stop it.
- Check the fuel system for leaks. Refer to [⇒ “3.11 Fuel System, Performing Leak Test”, page 305](#) .
- Read the DTC memory for the Engine Control Module using the ⇒ Vehicle diagnostic tester in “Guided Function”.
- Perform a road test where the accelerator pedal is fully depressed at least one time. Then check the high pressure system again for leaks.



- Read the DTC memory for the Engine Control Module again using the ⇒ Vehicle diagnostic tester in "Guided Functions".
- Install the engine cover. Refer to ⇒ ["1.6 Engine Cover, Removing and Installing", page 87](#).

### 3.8 Fuel Pressure Sensor - G247- , Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1332 40-200Nm - VAG1332-

#### Function

The Fuel Pressure Sensor - G247- (rail pressure sensor) is located in the rail element (high pressure reservoir). It measures the current fuel pressure in the high pressure system and delivers a voltage signal to the Engine Control Module - J623- .

If the Fuel Pressure Sensor - G247- malfunctions, the pressure is controlled via an Engine Control Module - J623- characteristic map (maximum engine speed is limited to approximately 3000 RPM in emergency operation mode).



#### DANGER!

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to ⇒ ["2 Guidelines for Clean Working Conditions", page 279](#).*

*Always pay attention to these instructions before and during work.*

#### Removing:

- Remove the engine cover. Refer to ⇒ ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Before removing, clean the threaded area around the Fuel Pressure Sensor - G247- (for example using commercially available cleaning solvent). Contamination must not enter the bore in the rail element (high pressure reservoir).



#### Note

*Clean carefully, cleaner must not enter the connector.*

- Dry the Fuel Pressure Sensor - G247- .

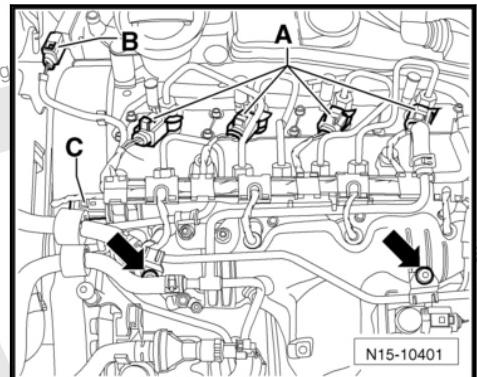


- Disconnect the connector from the Fuel Pressure Sensor - G247- -C-.
- Remove the Fuel Pressure Sensor - G247- .
- Extract the contamination from the rail element bore (threads and sealing surface). Do not use mechanical tools.



#### Note

*Seal the rail element bore immediately with a suitable plug to prevent contaminants from entering.*



#### Installing:



#### Note

- ◆ Check the Fuel Pressure Sensor - G247- sealing surface and threads for damage.
- ◆ Check the sealing surface on the rail element bore.
- ◆ The Fuel Pressure Sensor - G247- threads are coated with an anti-friction coating so they must be free of oil and grease.

- First tighten the Fuel Pressure Sensor - G247- by hand.
- Tighten the Fuel Pressure Sensor - G247- :
- Tightening specification -Item 14- [⇒ Item 14 \(page 287\)](#)
- After installing, let the engine run at a moderate speed for a few minutes and then stop it.
- Check the fuel system for leaks. Refer to [⇒ “3.11 Fuel System, Performing Leak Test”, page 305](#) .
- Read the DTC memory for the Engine Control Module - J623- again. Refer to Vehicle Diagnostic Tester in “Guided Functions”.
- Install the engine cover. Refer to [⇒ “1.6 Engine Cover, Removing and Installing”, page 87](#) .

### 3.9 High Pressure Fuel Pump, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Counterhold - Camshaft Gear - T10051-
- ◆ Union Nut Socket - T40055-
- ◆ Puller - Pulley - T40064-
- ◆ Puller - Pulley - Pressure Pad - T40064/1-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-
- ◆ Hose Clip Pliers - VAS6362-
- ◆ Engine Bung Set - VAS6122- (not illustrated)



## DANGER!

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).*
- ◆ *Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).*

*Always pay attention to these instructions before and during work.*

## Removing:

### Requirements

- Ignition switched off.
- Engine must be cold.

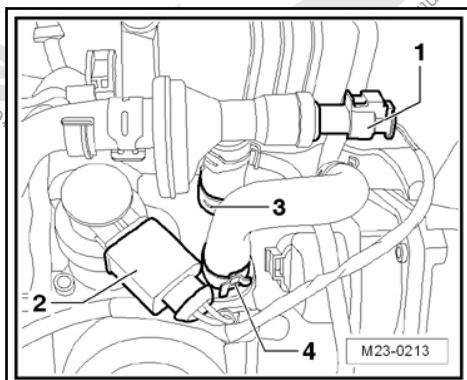


### Note

- ◆ *Only remove the high pressure fuel pump when the engine is cold.*
- ◆ *Make sure no contaminants enter the fuel system when removing the high pressure fuel pump.*
- ◆ *Seal off the connections in the fuel system using the plugs from the -VAS6122- .*

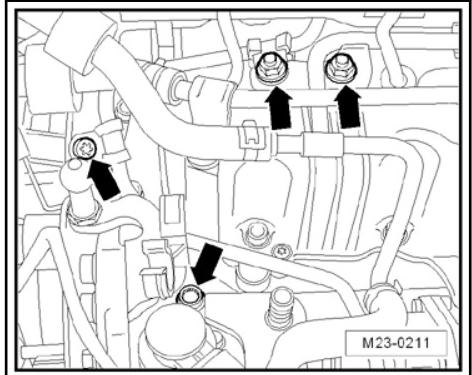
### Procedure

- Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to ["1.8 Toothed Belt, Removing, Installing and Tensioning", page 92](#), Toothed Belt, Removing, Installing and Tensioning.
- Disconnect from the Fuel Temperature Sensor - G81- -1- and from the Fuel Metering Valve - N290- on the high pressure fuel pump -2-.
- Loosen the spring clips -3 and 4- with the -VAS6362- and disconnect the fuel lines at the high pressure fuel pump.
- Seal the lines so that no dirt can enter the fuel system.





- Loosen the high pressure line or fuel lines -arrows- on the intake manifold.
- Remove the protective strip, if equipped -Item 1- [⇒ Item 1 \(page 286\)](#).

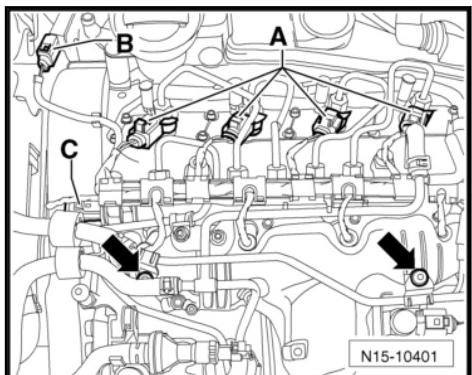


- Disconnect from the fuel injectors -A-, the Exhaust Pressure Sensor 2 - G451- -B- and the Fuel Pressure Sensor - G247- -C-.
- Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.
- Unclip the wiring harness from the wiring guide for the glow plugs.

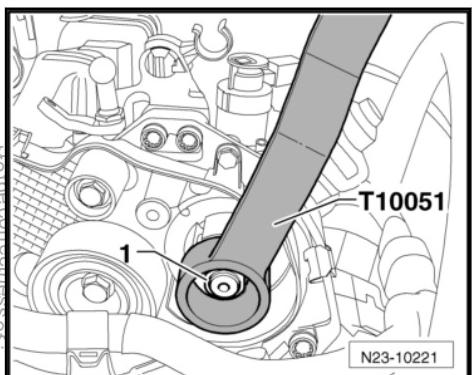


#### Caution

*Always follow the procedure »Glow Plug Connectors, Removing and Installing«.*

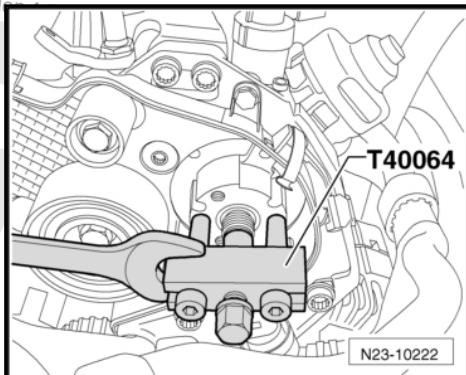


- Remove the glow plug connectors. Refer to [⇒ “1.3 Glow Plug Connectors, Removing and Installing”, page 402](#).
- Remove the high pressure line -Item 21- [⇒ Item 21 \(page 288\)](#) between the high pressure fuel pump and rail element (high pressure reservoir).
- Remove the toothed belt sprocket from the high pressure fuel pump.
- Hold the high pressure fuel pump hub with the -T10051- and remove the nut -1-.





- Position the -T40064- with the -T40064/1- as shown and remove the hub from the high pressure fuel pump. Counterhold with a 24 mm open-end wrench if necessary.
- Remove the high pressure fuel pump bolts -arrows-.

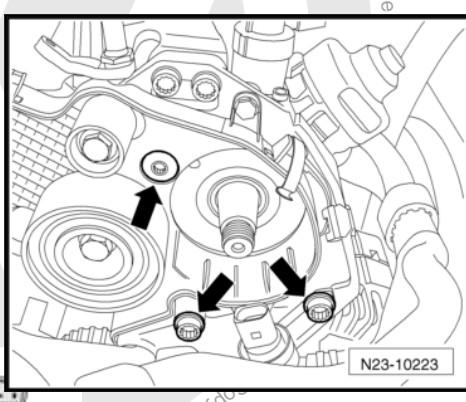


- Remove the high pressure fuel pump.

#### Installing:

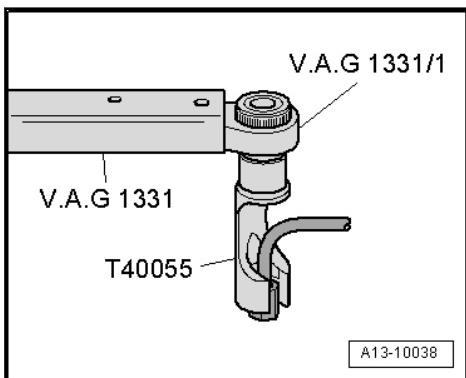
Install in reverse order of removal. Note the following:

- Make sure no contaminants enter the fuel system when installing the high pressure fuel pump.
- Only remove the plugs right before installing the fuel lines.
- Do not change the angles of the high pressure lines
- Make sure the line connections are secure.
- Do not interchange the supply line and the return line.
- First tighten the union nuts for the high pressure lines by hand.
- Make sure the high pressure lines are seated without tension.
- Tighten the high pressure lines using the -VAG1331- with -VAG1331/1- and -T40055- .



#### Tightening Specifications:

- Overview - Tooothed Belt Drive. Refer to [“1.3 Overview - Tooothed Belt Drive”, page 81](#) .
- Refer to [“3.3 Overview - Fuel System”, page 285](#) . Overview - Fuel System
- Installing and tensioning the toothed belt. Refer to [“1.8 Tooothed Belt, Removing, Installing and Tensioning”, page 92](#) .
- Fill the fuel system. Refer to [“3.10 Fuel System, Filling/Bleeding”, page 304](#) .



## 3.10 Fuel System, Filling/Bleeding



### Caution

*After installing the high pressure pump, it must be filled with fuel before starting the engine for the first time (never let the pump run dry).*



**Note**

- ◆ When installing the high pressure pump, make sure that no dirt enters the fuel system.
- ◆ Only remove the plugs right before installing the fuel lines.
- ◆ The fuel tank must be filled.

**To Fill the High Pressure Fuel Pump with Fuel, Proceed as Follows:**

- Switch the ignition on.
- Connect the Vehicle Diagnostic Tester and perform the "Vent Fuel system" Guided Function.

**Note**

The fuel pump are activated for 3 minutes.

- Then start the engine.
- After filling the fuel system, let the engine run at a moderate speed for a few minutes and then switch it off.
- Check the fuel system for leaks.
- Scan the DTC memory and delete the DTC memory entry if necessary.
- Test drive the vehicle for at least 20 km/h and test full-throttle acceleration at least once. Then check the high pressure area one more time for leaks.

**Note**

If there is still air in the fuel system, the engine may switch to emergency mode during the road test. Turn off the engine and erase the DTC memory. Then continue the road test.

- Scan the DTC memory again.

### 3.11 Fuel System, Performing Leak Test



#### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).

Always pay attention to these instructions before and during work.



#### Test Sequence

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).



- Let the engine run a few minutes at idle without pressing the accelerator pedal and then stop the engine. The fuel system bleeds itself.
- Check the entire fuel supply system for leaks.

If there are leaks despite correct tightening specifications, replace the affected component.

- Perform a road test where the accelerator pedal is fully depressed at least one time. Then check the high pressure area again for leaks.



#### Note

- ◆ *Follow all applicable safety precautions during a road test. Refer to [page 277](#).*
- ◆ *If there is still air in the fuel system, the engine may switch to emergency mode during the road test. Stop the engine and delete all DTC entries. Refer to Vehicle Diagnostic Tester "Guided Functions".*
- Install the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#)

## 3.12 Pressure Retaining Valve in Fuel Return, Checking

### Special tools and workshop equipment required

- ◆ Fuel Return System Tester - VAS6330- (not illustrated)

### Function

The pressure retaining valve in the fuel return has the function of always maintaining a residual pressure (control quantity) of approximately 10 bar.

The fuel injectors require this control quantity to function correctly.

### Test Sequence



#### DANGER!

- ◆ *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).*
- ◆ *Follow the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).*

*Always pay attention to these instructions before and during work.*

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Remove the protective strip, if equipped. Refer to -Item 1- [Item 1 \(page 286\)](#).
- Before removing, clean the return line connection on cylinder 1 with a commercially available cold cleaning agent, for example.
- Dry the cylinder 1 return line connection.

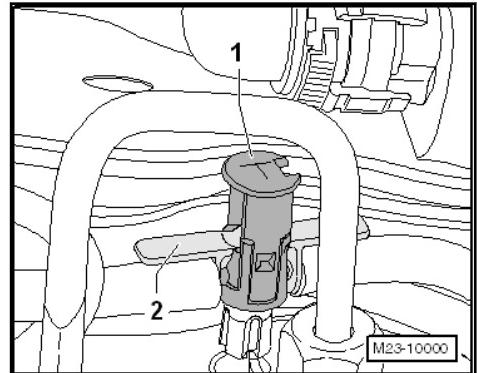


- Cover the cylinder 1 return line connection with a cleaning cloth.
- Remove the fuel return line connection from cylinder 1. Press the connection at the tabs -2- downward and pull the center piece -1- upward to release.



#### Note

*Pay attention to cleanliness. Dirt must not enter the return line and the connection on the fuel injectors.*



- Install the Fuel Return System Tester - VAS6330- between the return line connection on the fuel injector and the return line.
- Start the engine and let it run at idle speed.
- Check the pressure on the pressure gauge.
- Specified value: 8 to 14 bar

If the Specified Value is not Obtained:

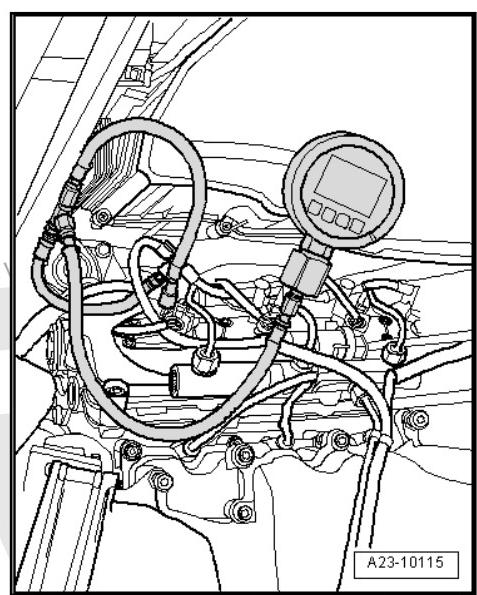
- Replace the pressure retaining valve. Refer to -Item 8- [Item 8 \(page 282\)](#).

If the Specified Value is Reached:

- Turn off the engine. The pressure indicator value on the pressure gauge must remain constant.

If the Pressure Indicator Value Decreases:

- Replace the pressure retaining valve.



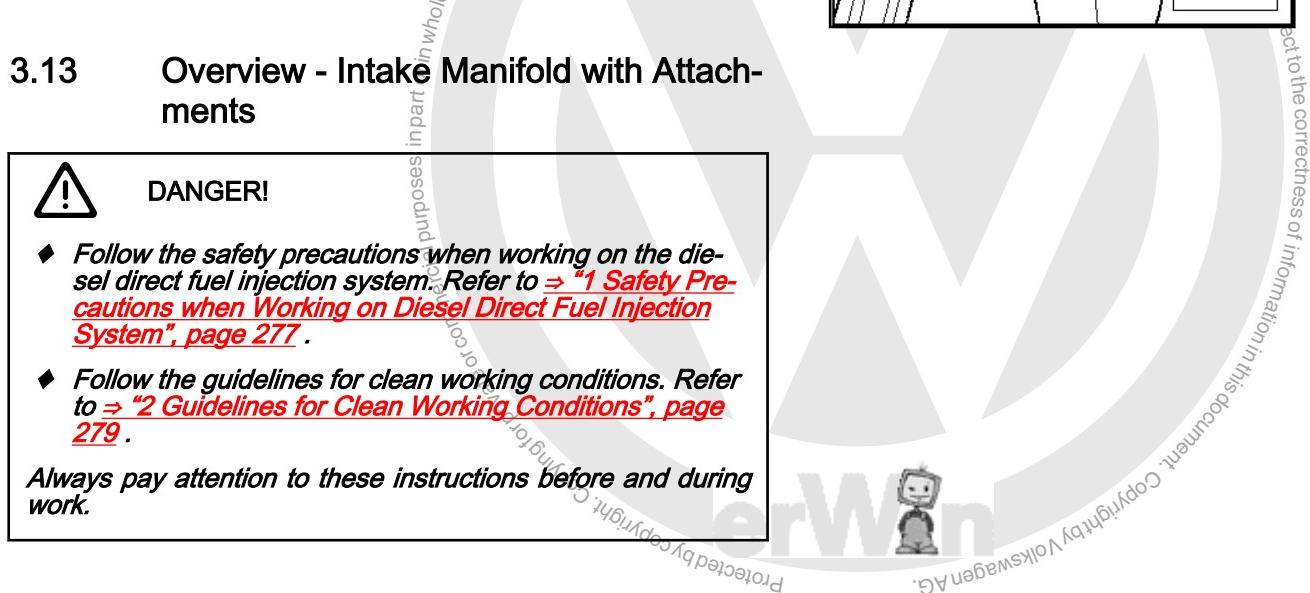
### 3.13 Overview - Intake Manifold with Attachments



#### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).
- ◆ Follow the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).

*Always pay attention to these instructions before and during work.*





### 1 - Intake Manifold

- With Intake Flap Motor - V157-
- With intake air swirl optimization
- Must not be disassembled
- Removing and Installing. Refer to ["3.14 Intake Manifold, Removing and Installing", page 309](#).

### 2 - Bolt

- 8 Nm

### 3 - Seal

- Replace

### 4 - Seal

- Replace

### 5 - Connecting Pipe



#### Caution

*Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.*

- Replace after removal
- Install without tension

### 6 - Bolt

- 20 Nm
- Use the Socket - Xzn 10 - T10385- for loosening and tightening

### 7 - Seal

- Replace

### 8 - Bolt

- 8 Nm

### 9 - Throttle Valve Control Module - J338-

### 10 - Bolt

- 10 Nm
- Refer to ["3.14 Intake Manifold, Removing and Installing", page 309](#)
- Removing and installing with the Socket - Xzn 8 - T40159-

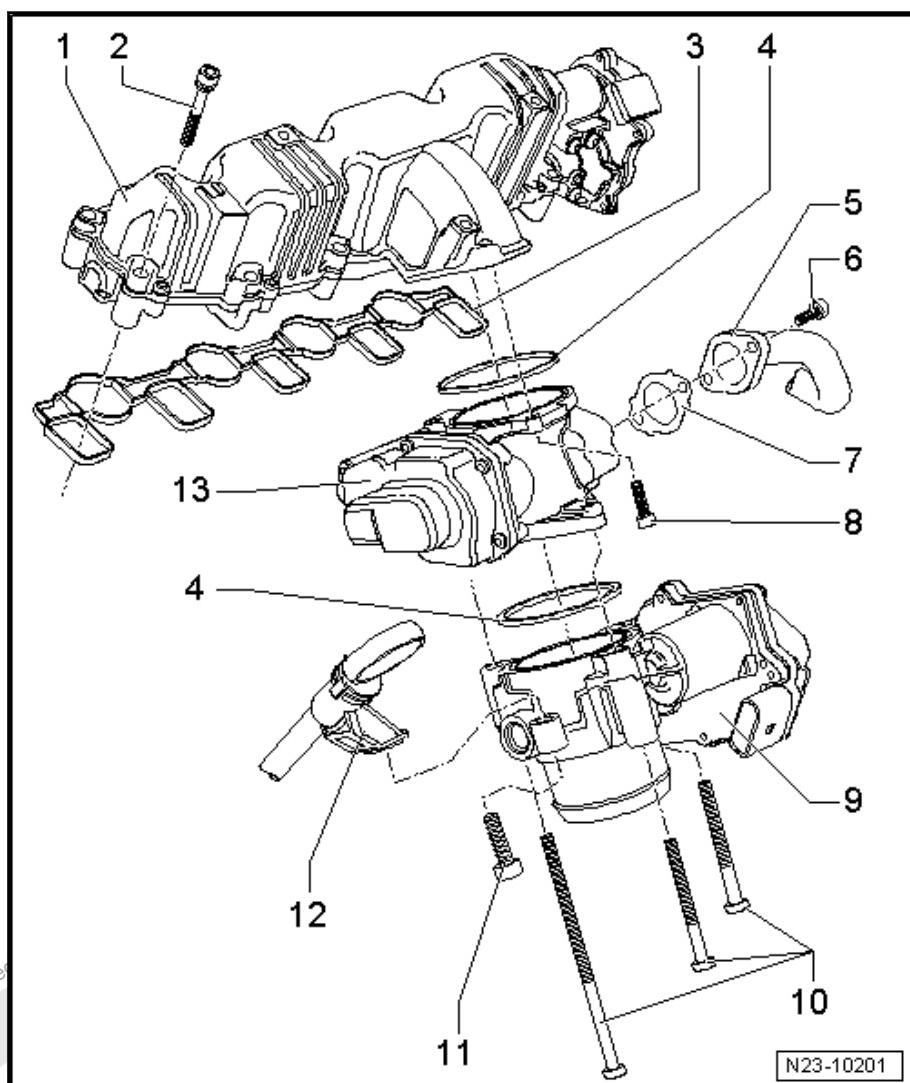
### 11 - Bolt

- 10 Nm
- Removing and installing with the Socket - Xzn 8 - T40159-

### 12 - Oil Dipstick

- Engine Oil Level, Checking. Refer to ["1.3 Engine Oil, Checking Level", page 138](#).

### 13 - EGR Valve - N18- with EGR Potentiometer - G212-





### 3.14 Intake Manifold, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Wheel Bolt Cap Pliers - 3314-

#### Vehicles with Intake Manifold Triple Square Bolts

- ◆ Socket - Xzn 8 - T40159-

#### Vehicles with Intake Manifold T30 Bolts

- ◆ Socket T30 - T10405-

#### Removing

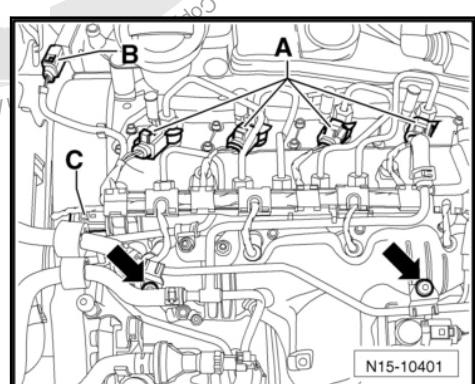
- Remove the engine cover. Refer to [“1.6 Engine Cover, Removing and Installing”, page 87](#).



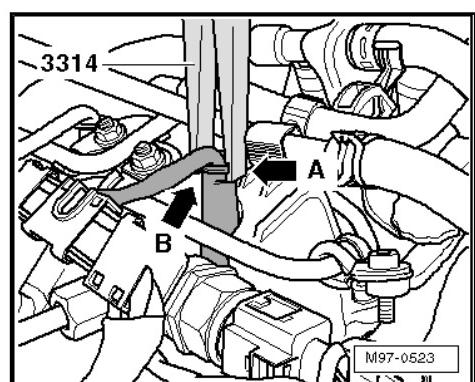
#### Caution

*Be careful not to damage the cable connection when removing the connectors. Otherwise the entire wiring harness has to be replaced. Do not squeeze the Wheel Bolt Cap Pliers - 3314- too hard when removing the connectors, otherwise the protective sleeve could be damaged.*

- Remove the connector from the fuel injectors -A-, the Exhaust Pressure Sensor 1 - G450- -B- and the Fuel Pressure Sensor - G247- -C-.
- Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.

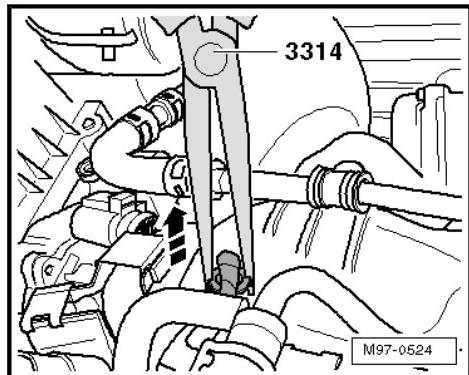


- Position the Wheel Bolt Cap Pliers - 3314- with the groove -arrow A- on the collar of the support sleeve -arrow B-.





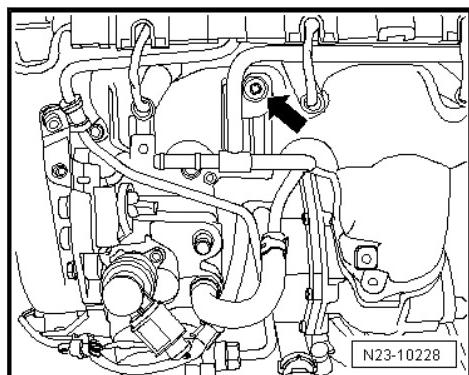
- Carefully disconnect the connector from the glow plug in direction of -arrow-.
- Remove the fuel return lines from the rail and the fuel injectors as well as from the high pressure pump.



- Remove the screw -arrow- and remove the return line.
- Remove the high pressure line between the high pressure pump and the rail.

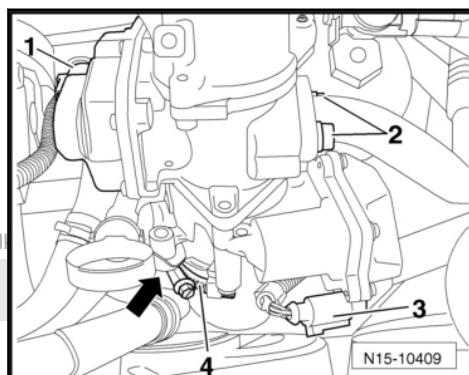
#### Vehicles with Intake Manifold T30 Bolts

- Remove the fuel injector lines to the injectors. Refer to ["3.3 Overview - Fuel System", page 285](#).
- Remove the high pressure reservoir (rail). Refer to ["3.3 Overview - Fuel System", page 285](#).



#### Continuation for All Vehicles

- Remove the connectors from the EGR Vacuum Regulator Solenoid Valve - N18- -1- and from the Throttle Valve Control Module - J338- -3-.
- Open the clamp -4- and remove the charge air hose.



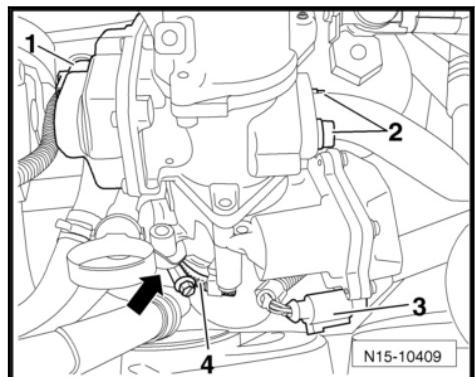


- Remove the bolts from the oil dipstick connection -arrow- and from the EGR connecting pipe -2-.
- If applicable remove the supports between the throttle valve control module and the crankcase.
- Remove the intake manifold bolts in a diagonal sequence starting at the outside and working in using the Socket - Xzn 8 - T40159- or Socket - T30 - T10405-
- Remove the intake manifold.

#### Installing

Install in reverse order of removal while noting the following:

- Replace the seals.
- Tighten the intake manifold bolts in a diagonal sequence starting from the inside and working outward. Tightening specification. Refer to -item 2- [⇒ Item 2 \(page 308\)](#).



#### Vehicles with Intake Manifold T30 Bolts

- Install the high pressure reservoir (rail). Refer to [⇒ "3.3 Overview - Fuel System", page 285](#).
- Install the fuel injector lines to the injectors. Refer to [⇒ "3.3 Overview - Fuel System", page 285](#).

### 3.15 Overview - Air Filter

[⇒ "3.15.1 Overview - Air Filter", page 311](#)

#### 3.15.1 Overview - Air Filter



### 1 - Intake Hose

- Check for secure fit
- Clean if there is contamination
- To the intake scoop on the turbocharger  
-Item 35- [⇒ Item 35 \(page 247\)](#)

### 2 - Mass Airflow Sensor - G70-

- Removing and installing. Refer to [⇒ "3.20 Mass Airflow Sensor G70, Removing and Installing", page 320](#)

### 3 - O-Ring

- Replace if damaged

### 4 - Vacuum Hose

- Check for secure fit and kink free routing
- From the muffler  
Connection diagram for vacuum hoses. Refer to [⇒ "4.5 Vacuum Hose Connection Diagram", page 271](#).

### 5 - Screw

- 2 Nm

### 6 - Air Filter Housing Upper Section

- Clean salt residue, dirt and leaves from the air filter housing-upper section

### 7 - Intake Air Duct

- Bolted to the lock carrier

### 8 - Screw

- 5 Nm

### 9 - Air Duct Hose

- Check for secure fit
- Clean if there is contamination

### 10 - Water Drain Hose

- Clean if there is contamination

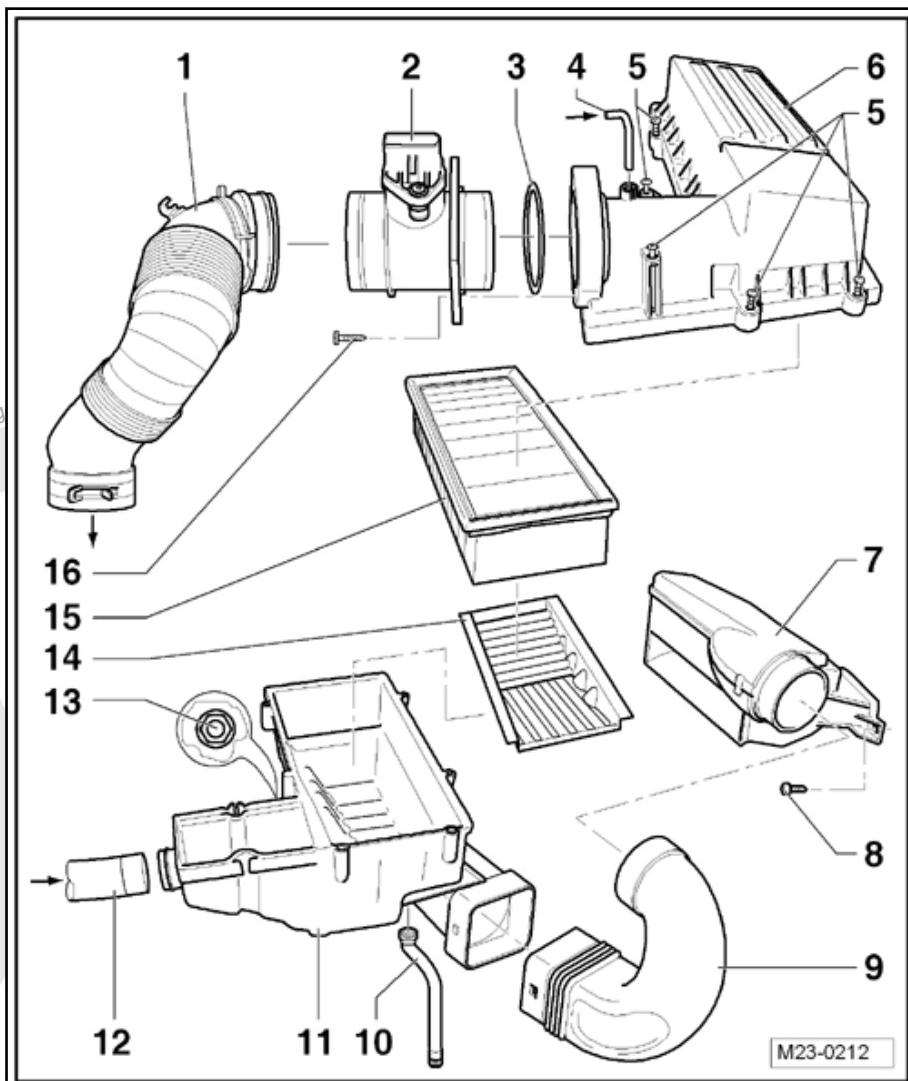
### 11 - Lower Section of Air Filter Housing

- Clean salt residue, dirt and leaves from the lower section of the air filter housing.

### 12 - Connecting Hose

- For the warm air intake
- Check for secure fit
- Clean if there is contamination
- From the warm air collector plate on the exhaust manifold -Item 2- [⇒ Item 2 \(page 245\)](#).

### 13 - Bolt





- 8 Nm
- Permanent bolt

#### 14 - Snow Screen

- Clean if there is contamination

#### 15 - Filter Element

- Always use Original air filter insert Parts Catalog.
- Follow the replacement intervals ⇒ Rep. Gr. MS ; Maintenance Schedules (USA and Canada) "Maintenance Tables".
- Removing and installing. Refer to ["3.17 Air Filter Element, Removing and Installing", page 316](#).

#### 16 - Screw

- 3.5 Nm

### 3.15.2 Overview - Air Filter, Engine Codes CBDA, CBDB, CEGA



#### 1 - Intake Hose

- To the turbocharger

#### 2 - Mass Airflow Sensor - G70-

#### 3 - O-Ring

- Replace if damaged

#### 4 - Vacuum Hose

- Check for secure fit and kink free routing
- To the Wastegate By-pass Regulator Valve - N75-
- Connection diagram for vacuum hoses. Refer to ["4.6 Vacuum Hose Connection Diagram, Engine Codes CBDA, CBDB, CEGA", page 272](#).

#### 5 - 2 Nm

#### 6 - Air Filter Housing Upper Section

- Clean salt residue, dirt and leaves from the air filter housing lower section

#### 7 - Air intake connector

- Attached to the lock carrier

#### 8 - 2 Nm

#### 9 - Connecting Hose

- Check for secure fit
- Clean if there is contamination

#### 10 - Water drain pipe

- Clean if there is contamination

#### 11 - Lower section of air filter housing

- Clean salt residue, dirt and leaves from the air filter housing lower section

#### 12 - 8 Nm

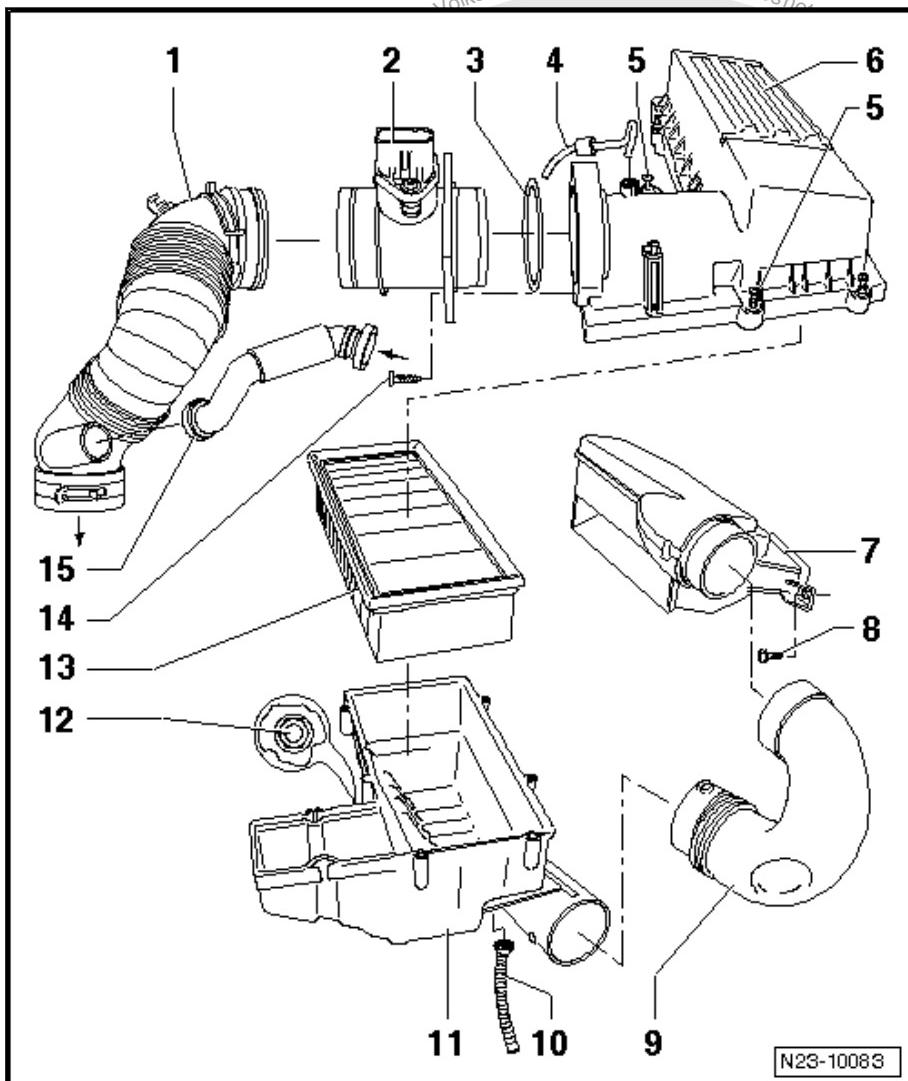
#### 13 - Filter Element

- Always use Original air filter insert Parts Catalog.
- Follow the replacement intervals ⇒ Maintenance ; Booklet 20.1 ; Service Work "Maintenance Tables".
- Removing and installing. Refer to ["3.17 Air Filter Element, Removing and Installing", page 316](#) .

#### 14 - 3.5 Nm

#### 15 - Connecting Pipe

- From the cylinder head cover
- For the crankcase ventilation

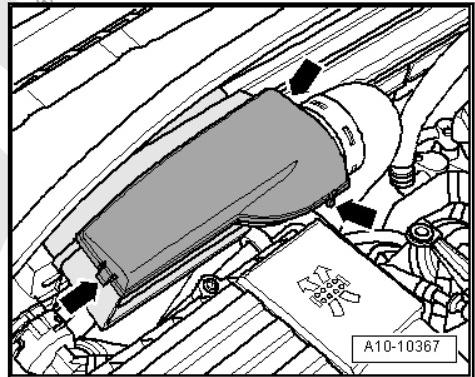




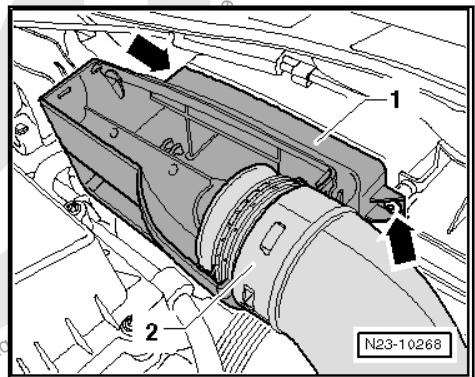
### 3.16 Air Filter Housing, Removing and Installing

#### Removing

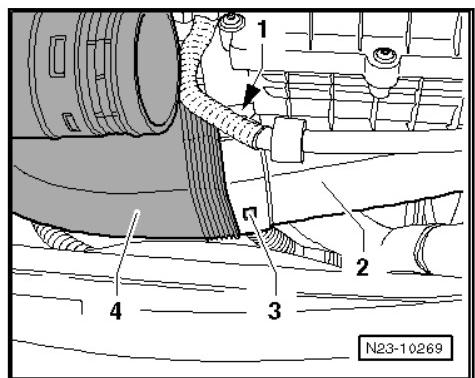
- Release the tabs -arrows- and open the cover on the air intake.
- Remove the connecting hose for the warm air intake -Item 12- **⇒ Item 12 (page 312)**.



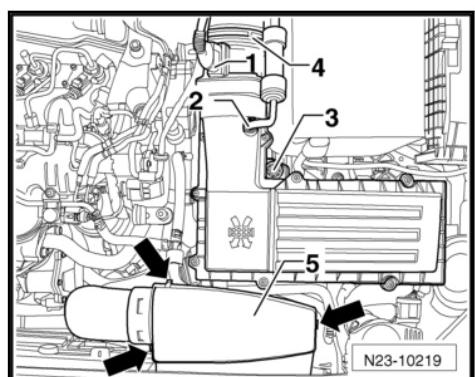
- Remove the screws -arrows- on the air intake -1- and pull the connecting hose -2- off the guide.



- Press the tab -1 and 3- and remove the connecting hose -4- from the air filter housing -2-.
- Disconnect the connector from the Mass Airflow Sensor -G70- -1- and the vacuum line -2-.



- Loosen the threaded connector on the air filter housing -3-.

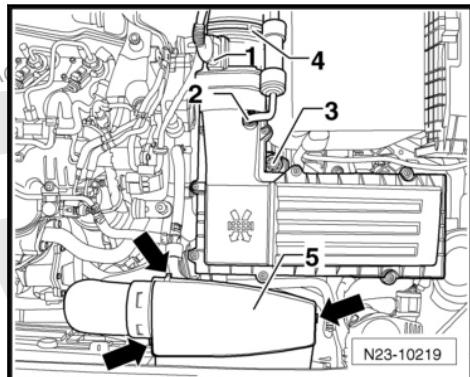




- Open the clamp -4- and remove the hose from the Mass Airflow Sensor - G70- .
- Remove the entire air filter housing.

#### Installing

Install in reverse order of removal.



### 3.17 Air Filter Element, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm - VAG1783-



#### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to **“1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 277**.
- ◆ Pay attention to the guidelines for clean working conditions. Refer to **“2 Guidelines for Clean Working Conditions”, page 279**.

Always pay attention to these instructions before and during work.



### Removing:

- Remove the bolts -arrows- from the air filter housing upper section.
- Lift up the air filter housing upper section and remove the air filter element.

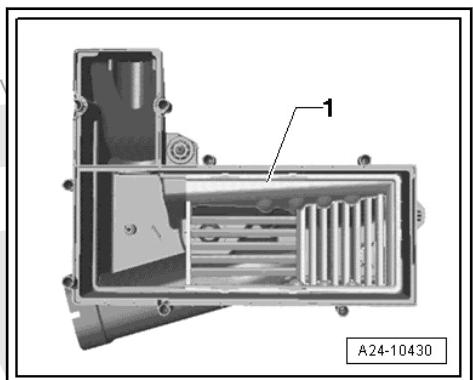
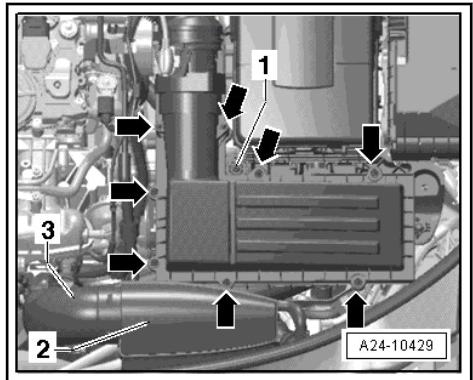
### Installing:

Install in reverse order of removal. Note the following:

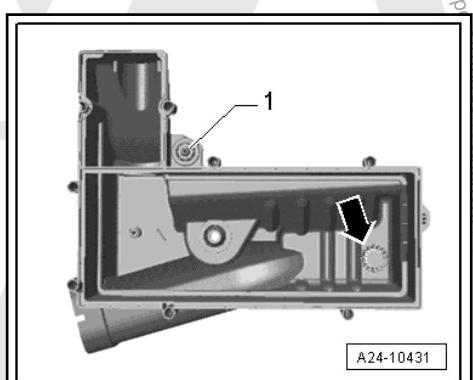
- If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Airflow Sensor - G70- and may be causing false mass airflow values. This results in reduced performance, since a lower injection quantity is calculated.
- Always use Original air filter insert. Refer to Parts Catalog.
- Follow all waste disposal regulations!
- The air filter housing must be clean.

Note the following when cleaning air filter housing with compressed air:

- To prevent malfunctions, cover critical air-flow engine components such as the Mass Airflow Sensor - G70- , air duct pipes etc. with a clean cloth.
- Check the Mass Airflow Sensor - G70- and the intake hose (clean air side) for contamination.
- Check the intake duct up to the air filter insert for contamination. If any contaminants are discovered, clean the air filter housing upper and lower section of salt residue, dirt and leaves. Wash or vacuum if necessary.
- Remove and clean the snow screen -1-.

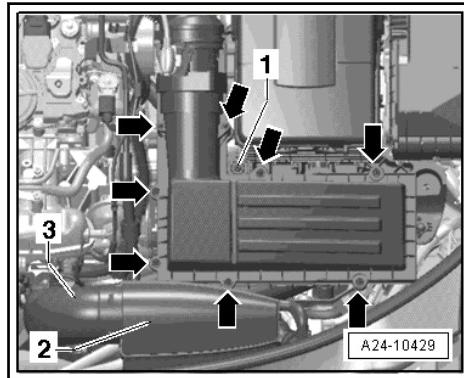


- Clean the water drain -arrow- and the lower section of the air filter housing.
- Make sure that air filter element is properly centered when placed into the mounting of the lower section of the air filter housing.
- Place upper section of air filter housing on to lower section or air filter housing carefully and without using excessive force. When doing this, make sure that upper section of air filter housing is not placed tilted on the air filter element (pay attention to sealing lip of air filter element).





- Tightening specification for the bolts on the air filter housing upper section -arrows-: 2 Nm.



### 3.18 Intake Air Pre-Heating Change-Over Valve, Checking

#### Special tools and workshop equipment required

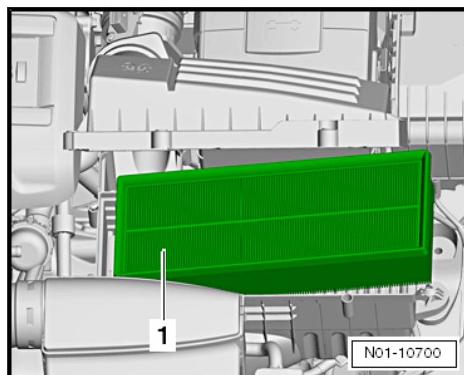
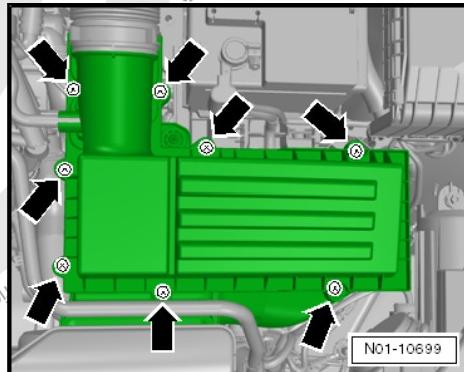
- Chilling spray (commercially available)
- Torque Screwdriver - VAS6494-



*Installed only on cold climate vehicles.*

#### Intake Air Pre-Heating Change-Over Valve, Checking:

- Remove the bolts -arrows- from the air filter upper section.
- Lift the air filter upper section and remove the air filter element -1-.



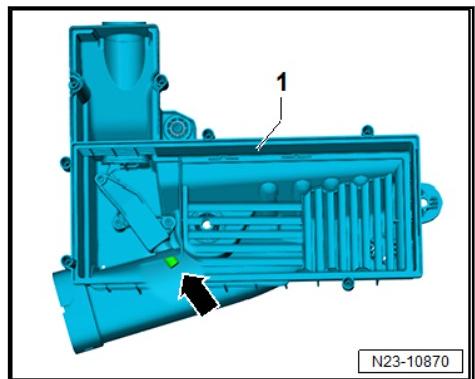


- Remove the snow screen.
- Spray the thermo element -arrow- with cold spray.
- ◆ The intake air pre-heating change-over valve must seal the warm air connection completely at +12 °C (53.6 °F) and above.
- ◆ The intake air pre-heating change-over valve must open the warm air connection completely at +2 °C (53.6 °F) and below.



#### Note

*The intake air pre-heating change-over valve opens and closes with a slight delay, since the expanding element must first cool down or warm up.*



N23-10870

#### Test not OK

Intake Air Pre-Heating Change-Over Valve, Replacing. Refer to  
[⇒ “3.19 Intake Air Pre-Heating Change-Over Valve, Removing and Installing”, page 319.](#)

### 3.19 Intake Air Pre-Heating Change-Over Valve, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Screwdriver - VAS6494-

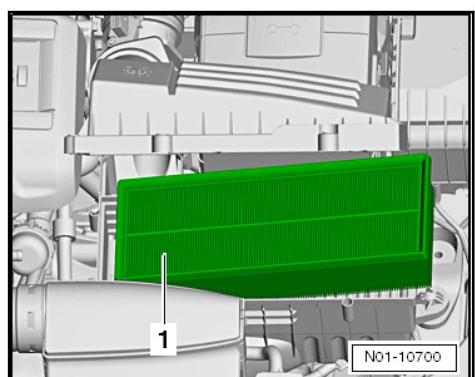
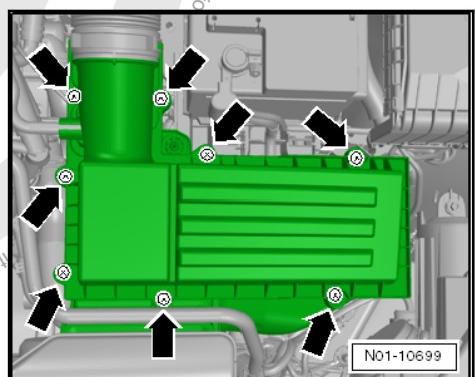


#### Note

*Installed only on cold climate vehicles.*

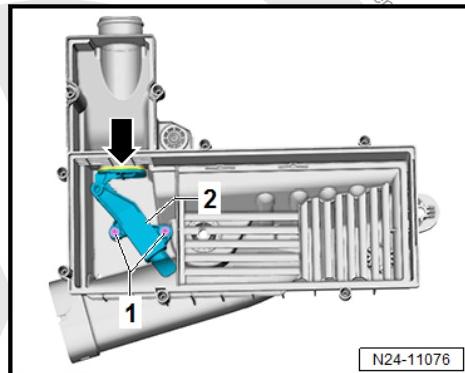
#### Removing

- Remove the bolts -arrows- from the air filter upper section.
- Lift the air filter upper section and remove the air filter element -1-.



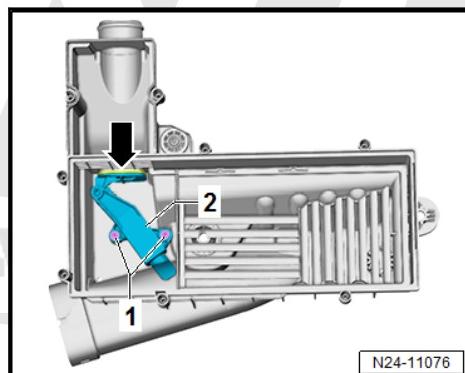


- Remove the bolts -1-.
- Remove the intake air pre-heating change-over valve -2-. Push the change-over valve slightly in the direction of -arrow- to do this.

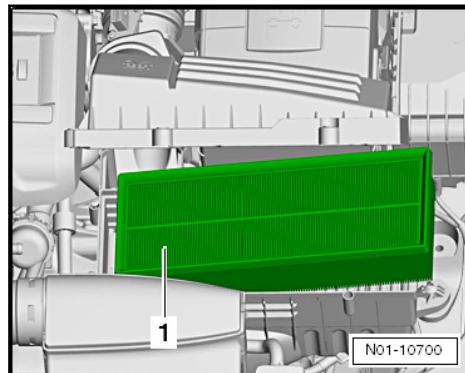


### Installing

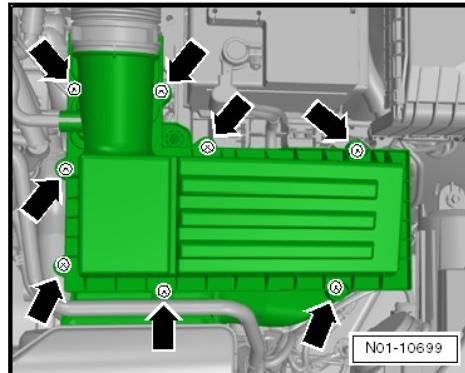
- Insert the intake air pre-heating change-over valve -2-. Push the change-over valve slightly in the direction of -arrow- to do this.
- Install the screws -1- and tighten to 1.6 Nm.



- Insert the air filter element -1-.



- Mount the air filter upper section, install the screws -arrows- and tighten to 2 Nm.



## 3.20 Mass Airflow Sensor - G70- , Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm - VAG1783-
- ◆ Hose Clip Pliers - VAS6362-



## DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ["1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 277](#).
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ["2 Guidelines for Clean Working Conditions", page 279](#).

*Always pay attention to these instructions before and during work.*

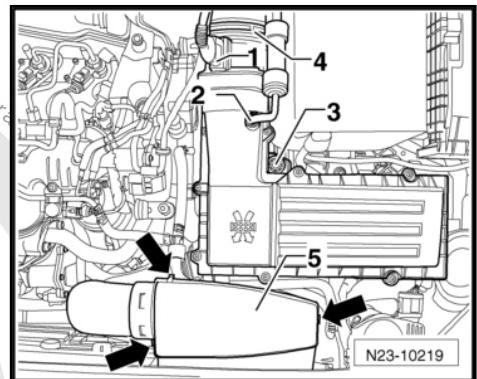
### Removing:

- Disconnect the connector -1- from the Mass Airflow Sensor - G70- .
- Loosen the spring clip -4- with the -VAS6362- and disconnect the intake hose from the Mass Airflow Sensor - G70- .
- Remove both bolts from the Mass Airflow Sensor - G70- and carefully remove the Mass Airflow Sensor - G70- from the guide on the air filter housing upper section.

### Installing:

Install in reverse order of removal. Note the following:

- Replace the O-ring if damaged.
- If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Airflow Sensor - G70- and may be causing false mass airflow values. This results in reduced performance, since a lower injection quantity is calculated.
- Always use Original air filter insert. Refer to Parts Catalog.
- Check the Mass Airflow Sensor - G70- and the intake hose (clean air side) for contamination.
- Check the intake duct up to the air filter insert for contamination. If any contaminants are discovered, clean the air filter housing upper and lower section of salt residue, dirt and leaves. Wash or vacuum if necessary. Air Filter Element, Removing and installing. Refer to ["3.17 Air Filter Element, Removing and Installing", page 316](#) .
- Tightening specification for bolts on the Mass Airflow Sensor - G70- : 3.5 Nm





## 4 Engine Control Module

⇒ “[4.1 Engine Control Module J623 without Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011](#)”, page 322

⇒ “[4.2 Engine Control Module J623 with Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011](#)”, page 323

⇒ “[4.3 Engine Control Module J623 , Removing and Installing, Jetta from MY 2011 Only](#)”, page 326

### 4.1 Engine Control Module - J623- without Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011

**Special tools and workshop equipment required**

- ◆ Vehicle Diagnosis System - VAS5051B-

#### Note

If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.

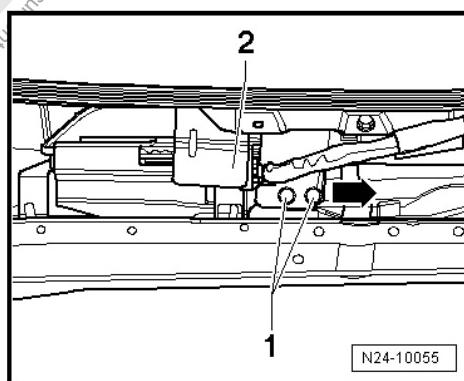
**Removing:**

**Conditions**

- Ignition switched off.

**Procedure**

- Remove the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover .
- Remove the bolts -1- and remove the cover plate -2-.





- Release the front connector -1- from the Engine Control Module - J623- and remove it.
- Pry up locking mechanism -2- slightly.
- Then push the Engine Control Module - J623- in the direction of -arrow- out of the bracket.
- Now release the rear connector from the Engine Control Module - J623- and remove it.

#### Installing:

- Connect and lock the rear connector to the Engine Control Module - J623- .
- Slide the Engine Control Module - J623- onto the retaining plate.
- Push the locking mechanism -2- against the Engine Control Module - J623- .
- Now connect and lock the front connector -1- to the Engine Control Module - J623- .
- Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover
- Install the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".
- Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester "Guided Functions".
- Perform a road test.



#### Note

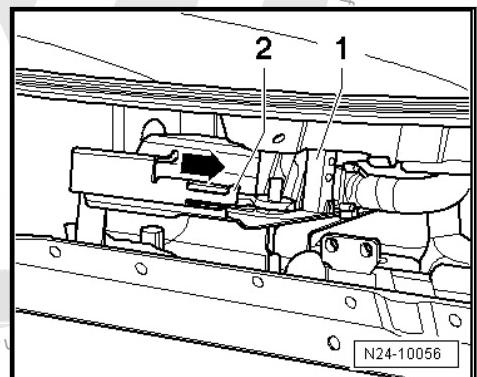
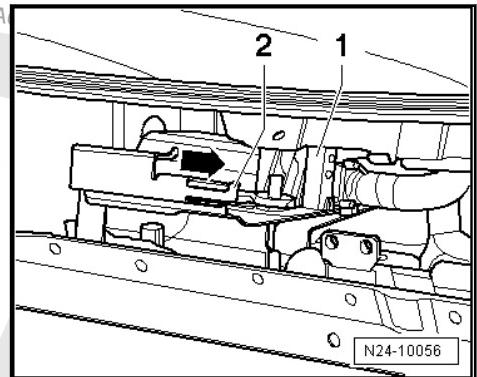
*Follow all applicable safety precautions during a road test. Refer to [page 277](#).*

- Check the Engine Control Module - J623- DTC memory again.

## 4.2 Engine Control Module - J623- with Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011

### Special tools and workshop equipment required

- ◆ Window Cutter - VAG1561A- with Blade Set - VAG1561/14-
- ◆ Hot Air Blower from Wiring Harness Repair Set - VAS1978B- .
- ◆ Vehicle Diagnostic Tester
- ◆ Locking pliers
- ◆ Safety Gloves





## Note

If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".

### Removing:

#### Conditions

- Ignition switched off.

#### Procedure

- Remove the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover .

## Note

The threads of the shear bolts are equipped with locking compound. By heating the shear bolts using a -VAS1978B-, the adhesive effect of the locking compound is lowered.



### Caution

Cover the wires, connectors and control modules in the area surrounding the Engine Control Module - J623- to prevent any burn damage.

Perform the adjustments on the -VAS1978B- 4- as shown:

- Turn potentiometer for temperature adjustment -2- to maximum heat output (600 °C (1,112 °F)).
- Move the two stage switch for air quantity -3- to position 3.



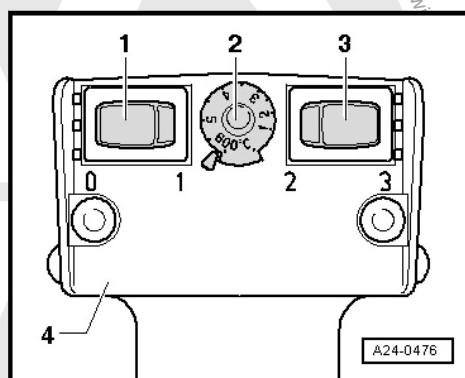
### WARNING

By heating the shear bolts, parts of the protective housing are heated intensely. Wear protective gloves to prevent injuries.

- Guide the -VAS1978B- nozzle on the shear bolt.
- Turn on the -VAS1978B- and warm up the bolts for approximately 20 to 25 seconds.
- Remove the shear bolt by the bolt head with pliers.

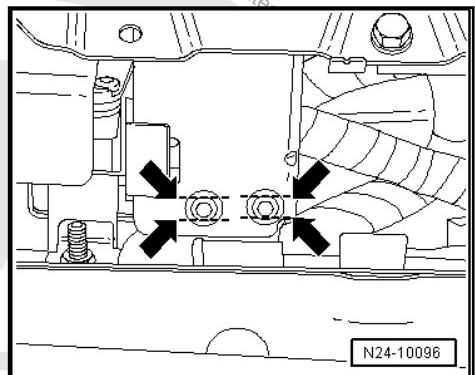
The procedure for the second shear bolt is exactly the same.

Do not let the bolts unscrew:

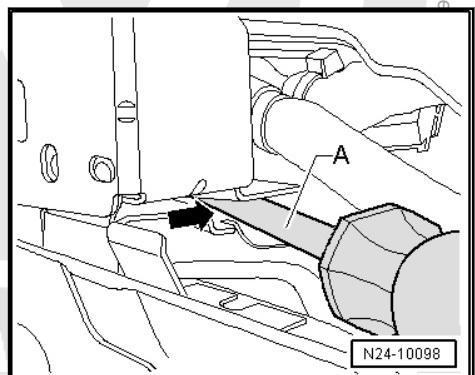




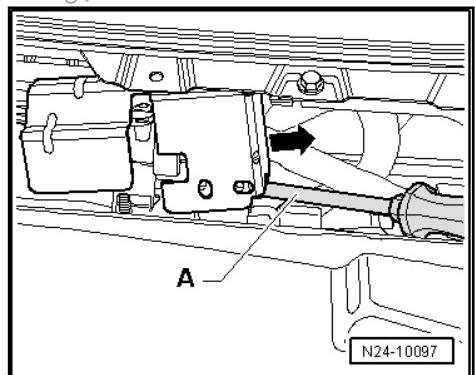
- Saw off the shear bolt heads so that there are two parallel surfaces -arrows- and then remove the bolts.



- Insert a screwdriver -A- between the protective housing and the retaining plate -arrow-.



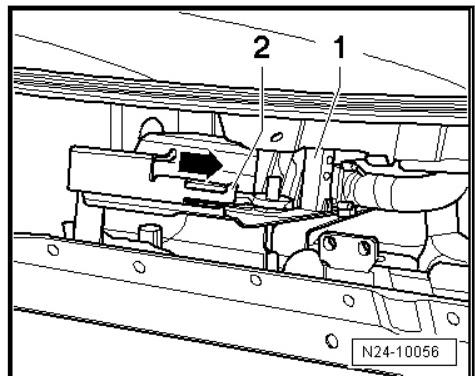
- Pry the protective housing upward using a screwdriver -A- and pull it off sideways from retaining plate -arrow-.
- Release the front connector -1- from the Engine Control Module - J623- and remove it.
- Pry up locking mechanism -2- slightly.



- Then push the Engine Control Module - J623- in the direction of -arrow- out of the bracket.
- Now release the rear connector from the Engine Control Module - J623- and remove it.

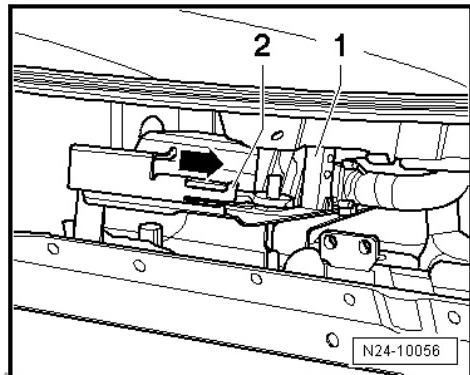
#### Installing:

- Connect and lock the rear connector to the Engine Control Module - J623- .
- Slide the Engine Control Module - J623- onto the retaining plate.

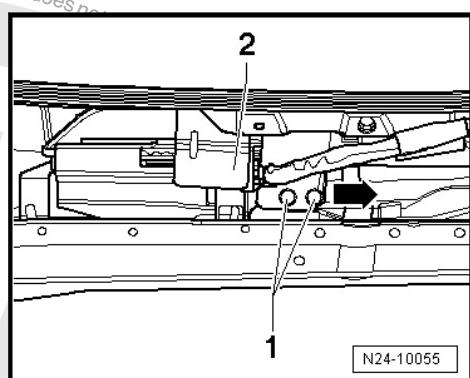




- Now connect and lock the front connector -1- to the Engine Control Module - J623- .
- Slide the protective housing on to the retaining plate.



- Tighten the shear bolts -1- uniformly until bolt heads shear off.
- Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover .
- Install the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".
- Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester "Guided Functions".
- Perform a road test.



#### Note

Follow all applicable safety precautions during a road test. Refer to [⇒ page 277](#).

- Check the Engine Control Module - J623- DTC memory again.

### 4.3 Engine Control Module - J623-, Removing and Installing, Jetta from MY 2011 Only

#### Note

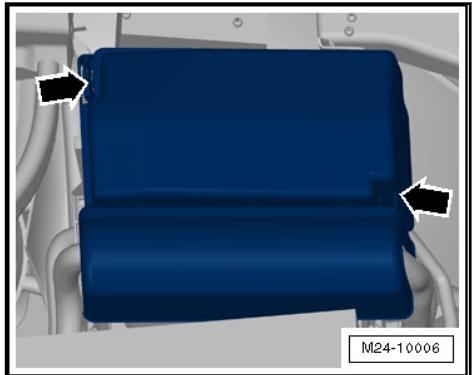
If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".

#### Removing:

- Ignition switched off.



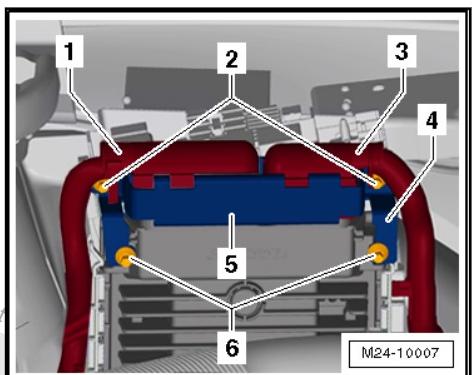
- Remove the E-box cover inside the engine compartment -arrows-.



M24-10006

#### Engine Control Module - J623- with Anti-Theft Protection

- Separate the threaded connection -2-.
- Remove the locking mechanism -5-.
- Disconnect the connectors -1 and 3- from the engine control module.
- Remove bolts -6- and remove the bracket -4-.



M24-10007

#### Engine Control Module - J623- without Anti-Theft Protection

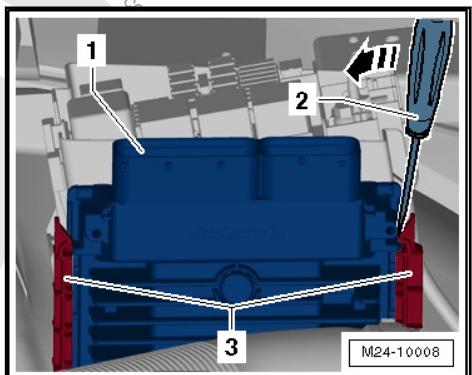
- Disconnect the connectors -1 and 3- from the engine control module.

#### Continuation for All Vehicles

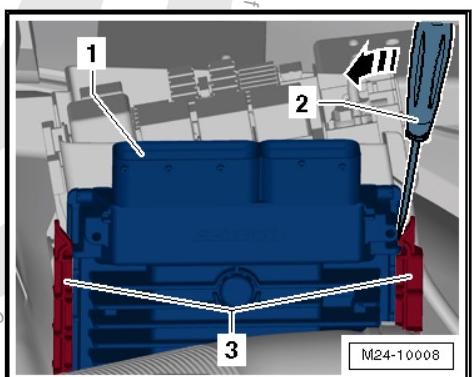
- Push the tabs on the side guides -3- carefully toward the outside with a screwdriver -2-.
- Remove the Engine Control Module -1- upward out of the side guides -3-.

#### Installing:

- Install the engine control module -1- into the guides -3- until it locks.



M24-10008

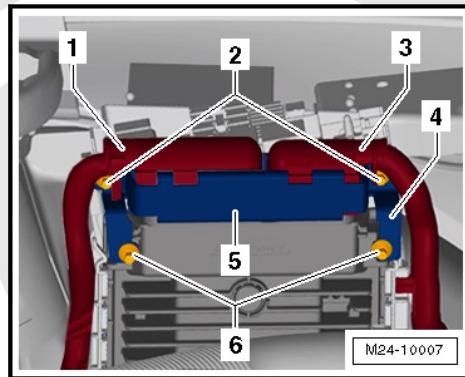


M24-10008



### Engine Control Module - J623- with Anti-Theft Protection

- Secure the bracket -5- with bolts -6- to the Engine Control Module.
- Tightening specification: 9 Nm.
- Connect the connectors -1 and 3- to the engine control module.
- Secure the locking mechanism -5- with shear bolts -6-.
- Tighten the shear bolts until the bolt head breaks off.

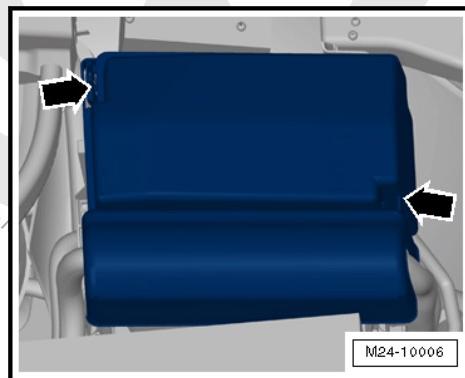


### Engine Control Module - J623- without Anti-Theft Protection

- Connect the connectors -1 and 3- to the engine control module.

### Continuation for All Vehicles

- Slide on the E-box cover until it is securely locked -arrows-.





## 5 Engine Control Module, Engine Codes CBDA, CBDB, CEGA

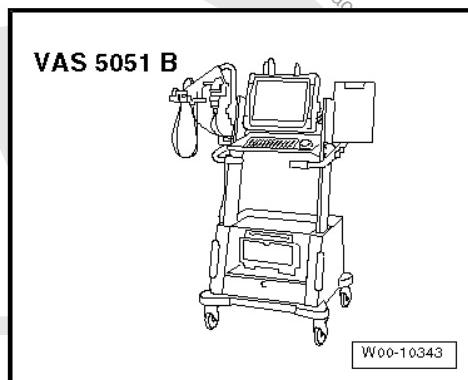
⇒ “[5.1 Engine Control Module J623 without Anti-Theft Protection, Removing and Installing](#)”, page 329 .

⇒ “[5.2 Engine Control Module J623 with Anti-Theft Protection, Removing and Installing](#)”, page 330 .

### 5.1 Engine Control Module - J623- without Anti-Theft Protection, Removing and Installing

**Special tools and workshop equipment required**

- ◆ Vehicle Diagnostic Tester

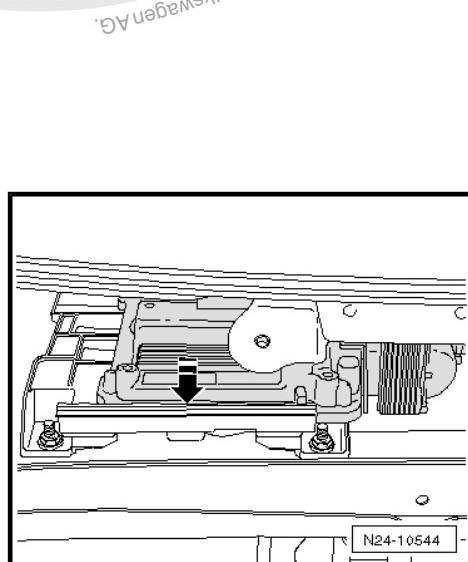


#### Note

If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.

#### Removing

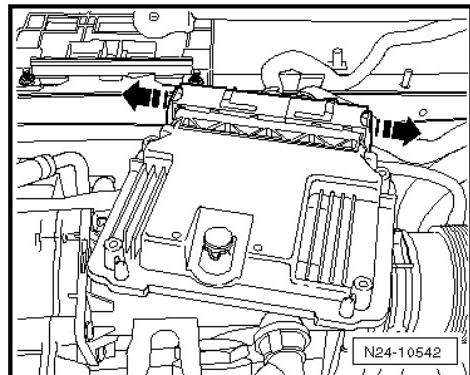
- Switch off the ignition.
- Remove the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
- Push the retaining frame in direction of -arrow- downward and remove the engine control module.



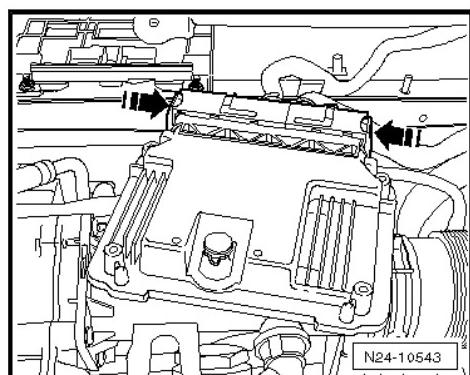


- Push the retainers in the -direction of the arrow- and disconnect the connector.

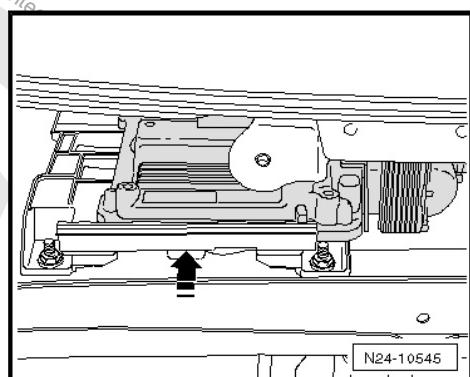
### Installing



- Connect the connector on the engine control module and push the retainers all the way in -the direction of the arrow-.



- Mount the engine control module into the retaining frame and push it in the -direction of arrow- upward.
- Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
- Install the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".
- Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester "Guided Functions".
- Perform a road test.



#### Note

Follow all applicable safety precautions during a road test. Refer to ⇒ [page 277](#).

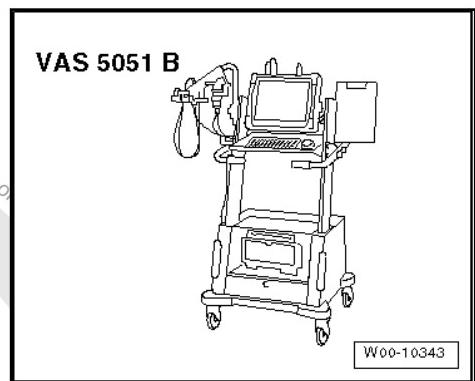
- Check the Engine Control Module - J623- DTC memory again.

## 5.2 Engine Control Module - J623- with Anti-Theft Protection, Removing and Installing

### Special tools and workshop equipment required



◆ Vehicle Diagnostic Tester



Not illustrated

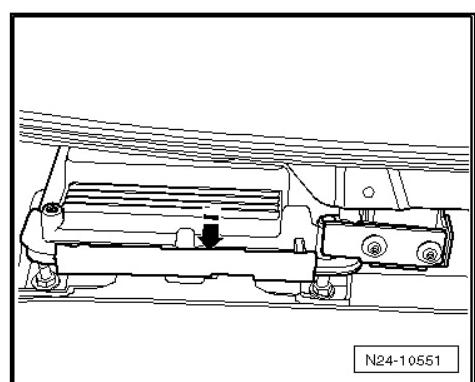
- ◆ Locking pliers
- ◆ Safety Gloves



If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".

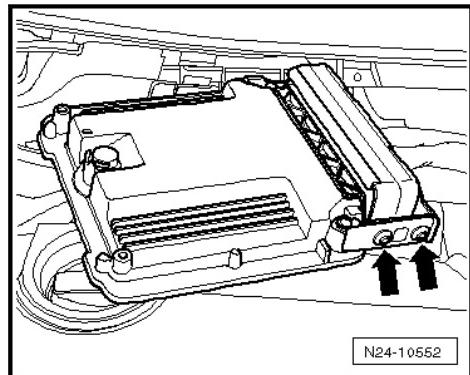
**Removing**

- Switch off the ignition.
- Remove the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
- Push the retaining frame in -direction of arrow- downward and remove the engine control module.

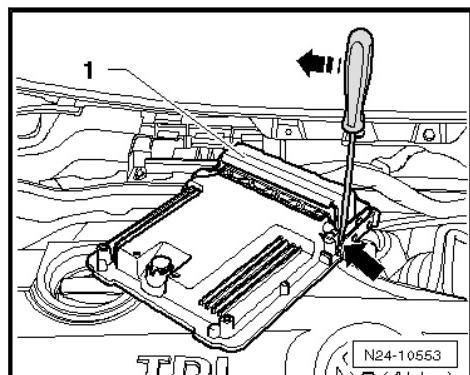




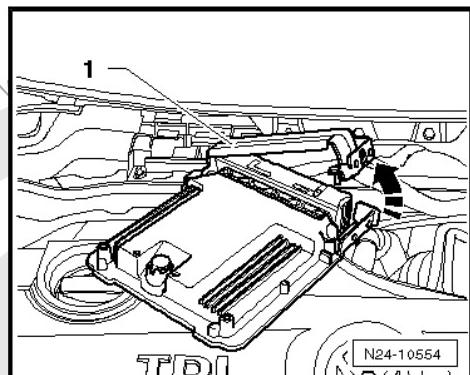
- Remove the shear bolts -arrows- with pliers.



- Slide a screwdriver between both locking plates -arrow-.
- Carefully push the driver in -direction of arrow- and at the same time bend the locking bracket -1- upward.

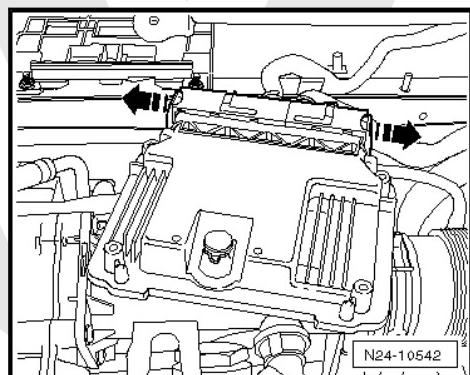


- Bend the securing bracket -1- in the -direction of the arrow- until it can be removed from the connectors.



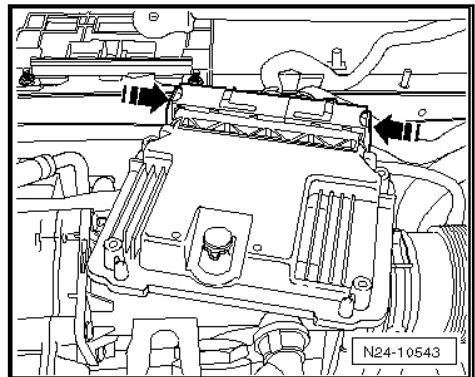
- Push the retainers in the -direction of the arrow- and disconnect the connector.

### Installing

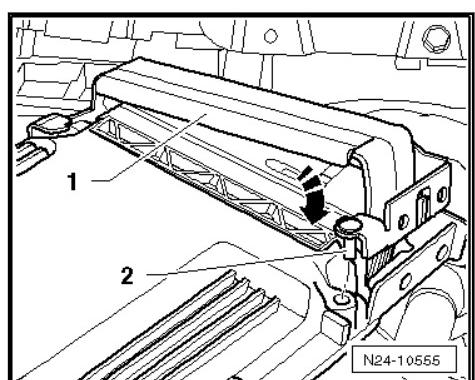




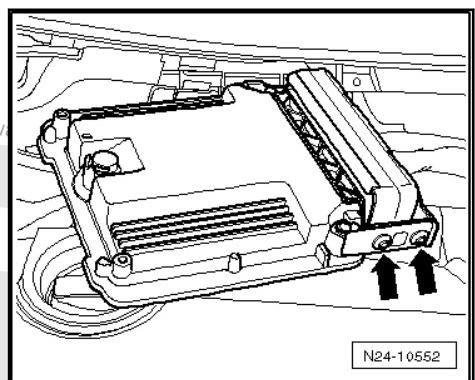
- Connect the connector on the engine control module and push the retainers all the way in -the direction of the arrow-.



- Place the locking bracket -1- on the connectors and press it in -the direction of the arrow-.
- Install the bolt -2- all the way into the hole in the engine control module.



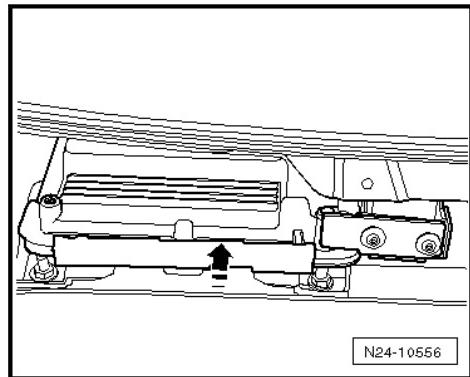
- Secure the locking bracket to the Engine Control Module -arrows- with new shear bolts.
- Tighten the shear bolts evenly until the bolt heads break off -arrows-.



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- Mount the engine control module into the retaining frame and push it in the -direction of arrow- upward.
- Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
- Install the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
- If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".
- Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester "Guided Functions".
- Perform a road test.



 Note

*Follow all applicable safety precautions during a road test. Refer to ⇒ page 277.*

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## 26 – Exhaust System, Emission Controls

### 1 Exhaust System

- ⇒ “[1.1 General Information](#)”, page 335
- ⇒ “[1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter](#)”, page 336
- ⇒ “[1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position](#)”, page 344
- ⇒ “[1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing](#)”, page 345
- ⇒ “[1.5 NOx Reduction Catalytic Converter, Removing and Installing](#)”, page 354
- ⇒ “[1.6 Overview - Exhaust Flap Control Module J883 with Slip Catalyst](#)”, page 355
- ⇒ “[1.7 Exhaust System Component Line Routing](#)”, page 357
- ⇒ “[1.8 Overview - Muffler](#)”, page 359
- ⇒ “[1.9 Exhaust System, Disconnecting and Connecting](#)”, page 363
- ⇒ “[1.10 Exhaust System, Installing without Tension](#)”, page 364
- ⇒ “[1.11 Exhaust System, Checking for Leaks](#)”, page 366
- ⇒ “[1.12 Clamping Sleeve Installation Position](#)”, page 366

#### 1.1 General Information



##### Note

- ◆ *Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ⇒ “[3.2 Overview - Turbocharger with Exhaust Manifold and Attachments](#)”, page 244 .*
- ◆ *Overview - Exhaust Flap Control Module - J883- with Slip Catalyst. Refer to ⇒ “[1.6 Overview - Exhaust Flap Control Module J883 with Slip Catalyst](#)”, page 355*
- ◆ *After installing the particulate filter with NOx reduction catalytic converter, make sure it is free of tension.*
- ◆ *Always replace the self-locking nuts, seals, gaskets and clamps.*
- ◆ *Hose connections are secured with either spring or hose clamps.*
- ◆ *Always replace clamp-type clips with spring-type clips.*
- ◆ *-VAS6362- or the VAS6340- are recommended for installing spring clips.*



## 1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter

⇒ “1.2.1 Overview - Particulate Filter with NOx Reduction Catalytic Converter, One-Piece (only CBEA)”, page 336 .

⇒ “1.2.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter, Two-Piece (CJAA, CBEA)”, page 340 .

### 1.2.1 Overview - Particulate Filter with NOx Reduction Catalytic Converter, One-Piece (only CBEA)





**1 - Exhaust Pressure Sensor**  
**2 - G451-**

- Bolted near the oil filler neck

**2 - Heat Shield**

- Replace if damaged

**3 - Bolt**

- 8 Nm

**4 - Bolt**

- 4 Nm

**5 - Control Line**

- Check for secure fit
- From the exhaust gas recirculation housing -item 8- [⇒ Item 8 \(page 380\)](#)

**6 - Bolt**

- 10 Nm

**7 - Shield**

- Note the installation position

**8 - Heated Oxygen Sensor - G39-**

- 52 Nm
- Use the Ring Wrench 7-Piece Set - 3337- to loosen and tighten.
- Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the sensor body

**9 - Seal**

- Replace

**10 - Clamp**

- 7 Nm
- Replace
- Note the installation position. Refer to [⇒ "1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position", page 344](#).

**11 - From the Turbocharger**

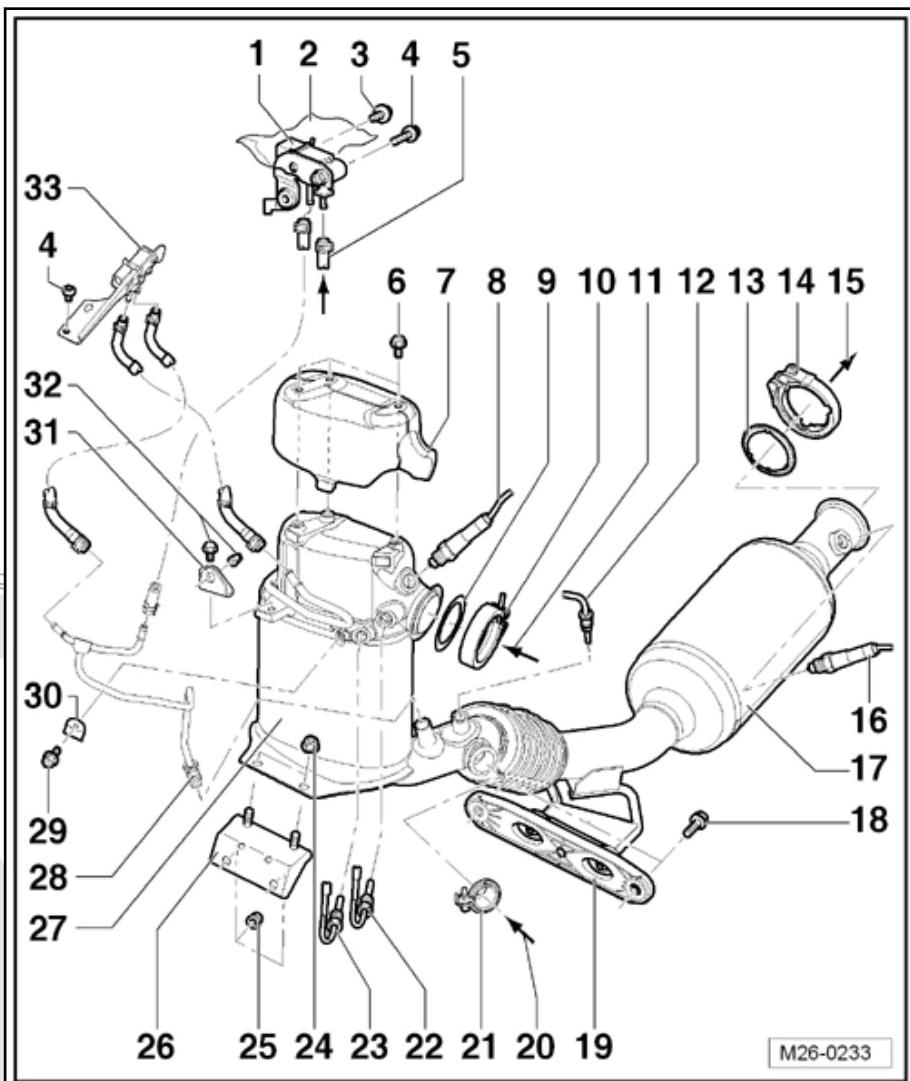
- item 14- [⇒ Item 14 \(page 246\)](#)

**12 - Exhaust Gas Temperature Sensor 4 - G648-**

- 45 Nm
- Mark the installation position before removal
- Only grease the threads with Hot Bolt Paste - G 052 112 A3- .
- Wire routing. Refer to [⇒ "1.7 Exhaust System Component Line Routing", page 357](#) .

**13 - Seal**

- Replace
- Installing. Refer to [⇒ Fig. "Install the Gasket Between Exhaust Door Control Unit -J883- and the NOx Reservoir or Slip Catalyst"](#), page 357 .



M26-0233

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#### 14 - Clamp

- 7 Nm
- Replace
- Note the installation position. Refer to [Fig. "Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst."](#), page 357 .

#### 15 - To Exhaust Door Control Unit - J883-

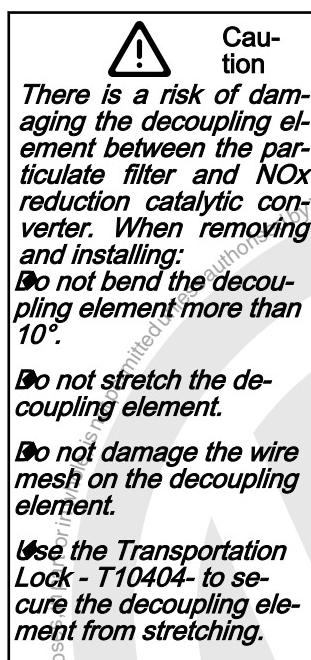
- item 4- [⇒ Item 4 \(page 356\)](#)

#### 16 - Oxygen Sensor After Catalytic Converter - G130-

- 52 Nm
- Use the Ring Wrench 7-Piece Set - 3337- to loosen and tighten.
- Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the sensor body
- Wire routing. Refer to ["1.7 Exhaust System Component Line Routing"](#), page 357 .

#### 17 - NOx Reduction Catalytic Converter

- Unit with particulate filter -item 27- [⇒ Item 27 \(page 339\)](#) (cannot be disconnected)



- Removing and Installing. Refer to ["1.4 Particulate Filter with NOx Absorption Catalytic Converter,  
Removing and Installing"](#), page 345 .

#### 18 - Bolt

- 25 Nm

#### 19 - Mount

- Install without tension

#### 20 - From the EGR filter

- item 9- [⇒ Item 9 \(page 380\)](#)

#### 21 - Clamp

- 3.5 Nm
- Replace
- Note the installation position. Refer to ["1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position"](#), page 344 .

#### 22 - Exhaust Gas Temperature Sensor 2 - G448-

- 45 Nm



- Note the installation position. Refer to [“1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 344](#).
- Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

#### 23 - Exhaust Gas Temperature Sensor 3 - G495-

- 45 Nm
- Note the installation position. Refer to [“1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 344](#).
- Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

#### 24 - Nut

- 23 Nm

#### 25 - Nut

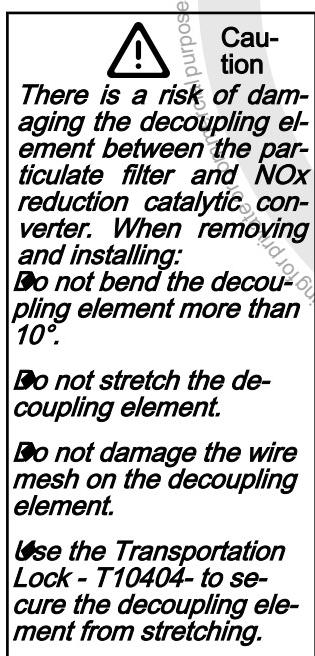
- 23 Nm

#### 26 - Bracket

- Note the installation position
- For the particulate filter
- Fastened to cylinder block
- Install without tension

#### 27 - Particulate Filter

- Unit with NOx reduction catalytic converter -item 17- [⇒ Item 17 \(page 338\)](#) (cannot be disconnected)



- Removing and Installing. Refer to [“1.4 Particulate Filter with NOx Absorption Catalytic Converter,  
Removing and Installing”, page 345](#) .
- After replacing, the ash load comparison adaptation must be set to “0” using the ⇒ Vehicle diagnostic tester in “Guided Functions”.

#### 28 - Control Wire

- 45 Nm
- Do not change the shape of the control line
- Install without tension

#### 29 - Bolt

- 9 Nm

#### 30 - Bracket

- For the control line



- Install without tension

### 31 - Bracket

- Note the installation position
- For the particulate filter
- Fastened to cylinder head
- Install without tension

### 32 - Bolt

- 23 Nm

### 33 - Exhaust Pressure Sensor 1 - G450-

- Connected to the Auxiliary Fuel Pump - V393- bracket

## 1.2.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter, Two-Piece (CJAA,CBEA)





#### 14 - Clamp

- 7 Nm
- Always replace
- Note the installation position Refer to [Fig. "Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst." , page 357](#) .

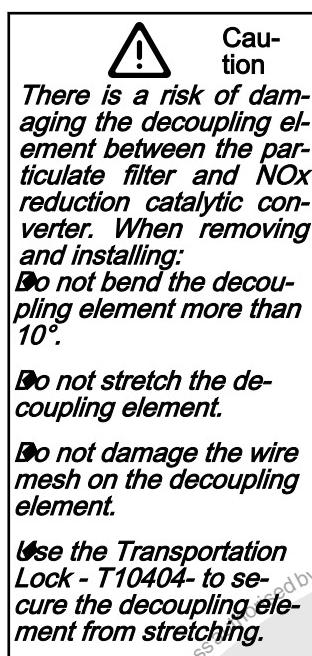
#### 15 - To Exhaust Door Control Unit - J883-

- Item 4- [Item 4 \(page 356\)](#)

#### 16 - Oxygen Sensor after Three Way Catalytic Converter - G130-

- 52 Nm
- Use the Ring Wrench 7-Piece Set - 3337- to loosen and tighten.
- Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the sensor body
- Wire routing. Refer to ["1.7 Exhaust System Component Line Routing" , page 357](#) .

#### 17 - NOx Reduction Catalytic Converter



- Removing and installing. Refer to ["1.5 NOx Reduction Catalytic Converter, Removing and Installing" , page 354](#) .

#### 18 - Clamp

- 7 Nm
- Always replace
- Note the installation position Refer to ["1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position" , page 344](#) .

#### 19 - Seal

- Always replace

#### 20 - Bolt

- 25 Nm

#### 21 - Mount

- Install without tension

#### 22 - From the EGR filter

- Item 9- [Item 9 \(page 380\)](#)

#### 23 - Clamp

- 3.5 Nm





- Always replace
- Note the installation position Refer to ["1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position", page 344](#).

#### 24 - Exhaust Gas Temperature Sensor 2 - G448-

- 45 Nm
- Note the installation position Refer to ["1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position", page 344](#).
- Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

#### 25 - Exhaust Gas Temperature Sensor 3 - G495-

- 45 Nm
- Note the installation position Refer to ["1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position", page 344](#).
- Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

#### 26 - Nut

- 23 Nm

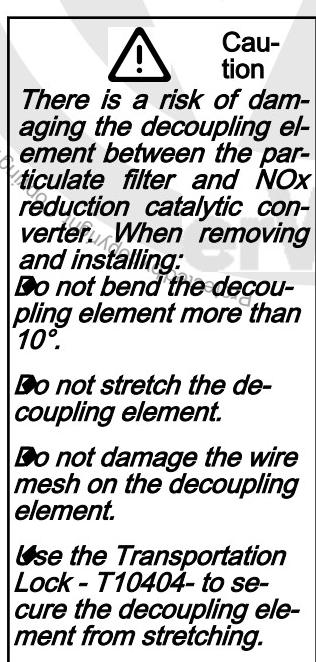
#### 27 - Nut

- 23 Nm

#### 28 - Bracket

- Note the installation position
- For the particulate filter
- Fastened to cylinder block
- Install without tension

#### 29 - Particulate Filter



- Removing and installing. Refer to ["1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing", page 345](#).
- After replacing, the ash load comparison adaptation must be set to "0". Refer to Vehicle Diagnostic Tester "Guided Functions".

#### 30 - Control Wire

- 45 Nm
- Do not change the angles of the control line
- Install without tension



**31 - Bolt**

- 9 Nm

**32 - Bracket**

- For the control line
- Install without tension

**33 - Bracket**

- Note the installation position
- For the particulate filter
- Fastened to cylinder head
- Install without tension

**34 - Bolt**

- 23 Nm

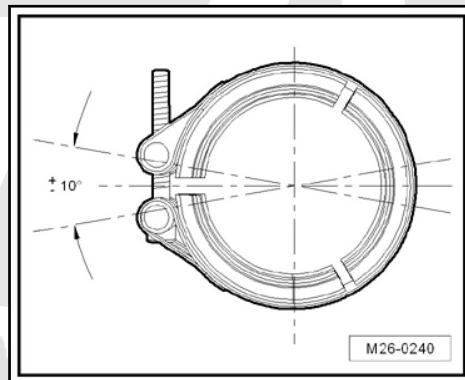
**35 - Exhaust Pressure Sensor 2 - G451-**

- Connected to the Auxiliary Fuel Pump - V393- bracket

### 1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position

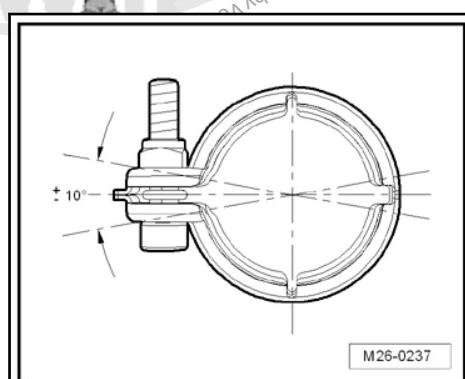
**Clamp Installation Position between the Particulate Filter and Turbocharger**

- Install the new clamp so the clamping bolt faces down and the  $\pm 10^\circ$  angle is maintained.



**Clamp Installation Position between the Particulate Filter and Exhaust Gas Recirculation Filter**

- Install the new clamp so the clamping bolt faces down and the  $\pm 10^\circ$  angle is maintained.

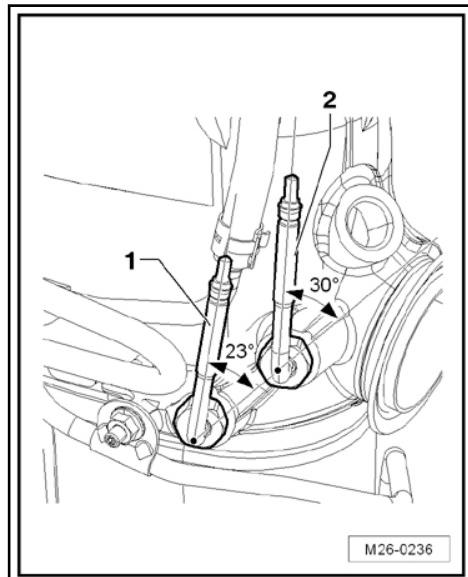




### Exhaust Gas Temperature Sensor Installation Position

- Install the Exhaust gas temperature sensor so the angles are maintained:
  - Exhaust Gas Temperature Sensor 3 - G495- -1-: angle -23°-.
  - Exhaust Gas Temperature Sensor 2 - G448- -2-: angle -30°-.

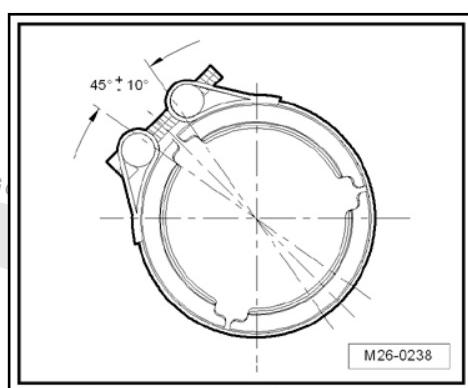
### Engine Codes CBEA, CJAA



M26-0236

### Installed Position: Clamp between the Particulate Filter and NOx Reduction Catalytic Converter

- Install the new clamp maintaining the  $-45^\circ \pm 10^\circ$ - angle.



M26-0238

## 1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing

### Special tools and workshop equipment required

- ◆ Locating Pins - T10096-
- ◆ Wrench - Sw13 - T10384-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Torque Wrench 1332 40-200Nm - VAG1332-
- ◆ Engine and Gearbox Jack - VAS6931-
- ◆ Hose Clip Pliers - VAS6362-
- ◆ Transportation Lock - T10404-





## Note

- ◆ The subframe must be lowered in order to remove and install the particulate filter with NOx reduction catalytic converter. The -T10096- are needed to secure the subframe.
- ◆ Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ["3.2 Overview - Turbocharger with Exhaust Manifold and Attachments", page 244](#).
- ◆ Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to ["1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 336](#).
- ◆ Overview - Exhaust Flap Control Module - J883- with Slip Catalyst. Refer to ["1.6 Overview - Exhaust Flap Control Module J883 with Slip Catalyst", page 355](#).
- ◆ Hose connections are secured with either spring or hose clamps.
- ◆ Always replace clamp-type clips with spring-type clips.
- ◆ -VAS6362- or the -VAS6340- are recommended for installing spring clips.

## Removing

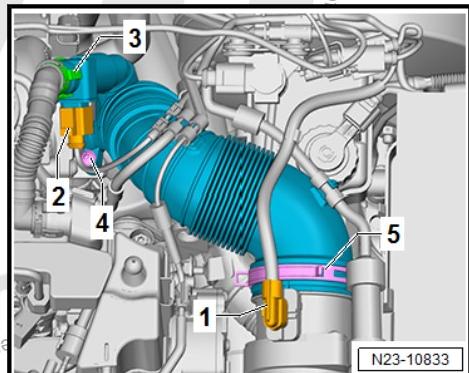


### WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

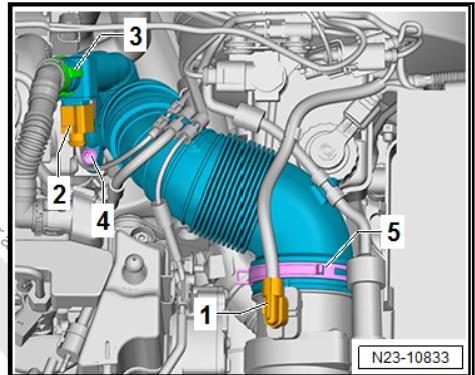
- ◆ Route all lines and wires in their original locations.
- ◆ For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.
- ◆ Make sure that there is sufficient clearance to all moving or hot components.

- Remove the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#).
- Disconnect the connectors -1 and 2-. Unclip all lines on the intake hose.
- Carefully remove and release the hose -3- on the heater for the crankcase ventilation.

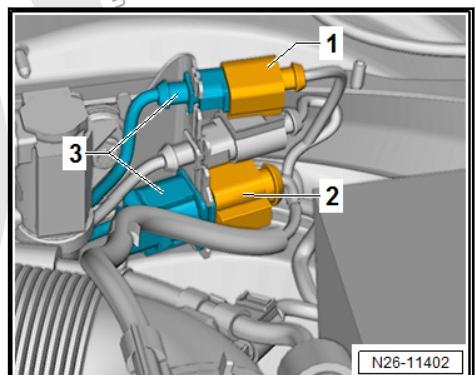




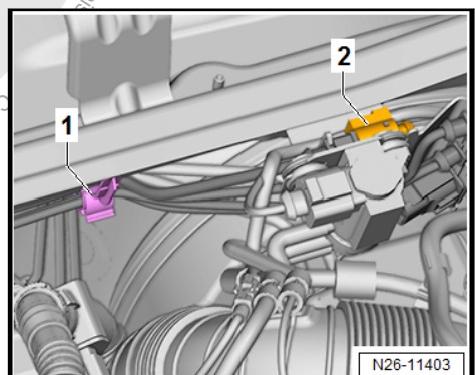
- Remove the permanent bolt -4- and loosen the clamp -5- with the Hose Clip Pliers - VAS6362- .
- Remove the intake hose from the Mass Airflow Sensor - G70- on the turbocharger by turning clockwise to release and remove it.
- Disconnect the »orange« connector for the Exhaust Gas Temperature Sensor 2 - G448- -1- as well as the »black« connector for the Heated Oxygen Sensor - G39- -2- on the plenum chamber bulkhead.



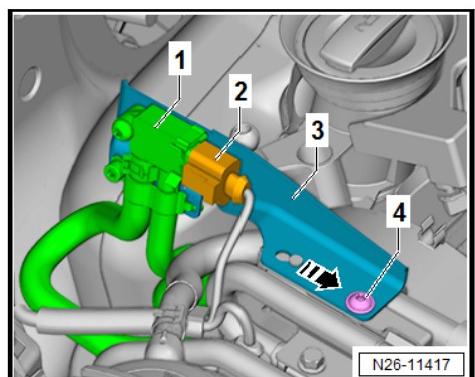
- Remove the lines -3- from the bracket and free up.



- Disconnect the »brown« connector for the Exhaust Gas Temperature Sensor 3 - G495- -2- (attached behind the bracket).
- Guide the lines out of the brackets -1- on the plenum chamber bulkhead and turbocharger.

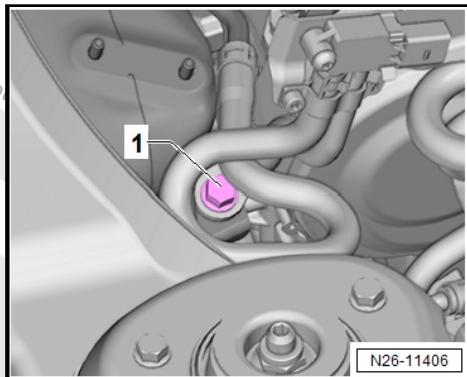


- Disconnect the connector -2- from the Differential Pressure Sensor - G505- -1-.
- Remove the bolt -4- and remove the bracket -3- with Differential Pressure Sensor - G505- -1- in the direction of -arrow- and set aside (control lines stay attached).

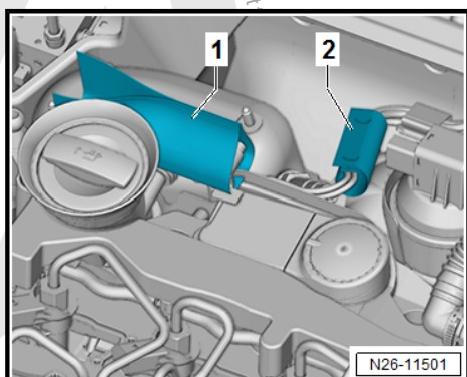




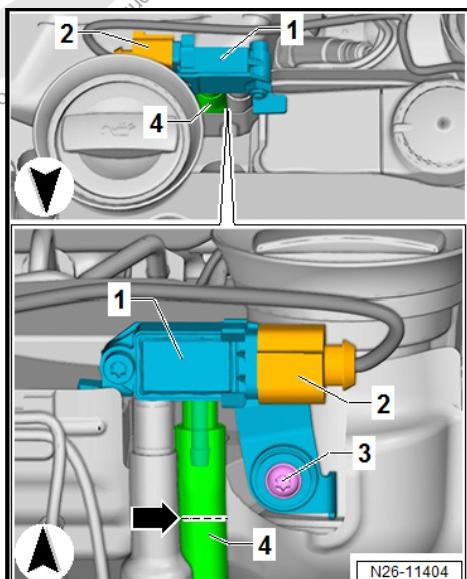
- Remove the bolt -1- on the upper particulate filter bracket.



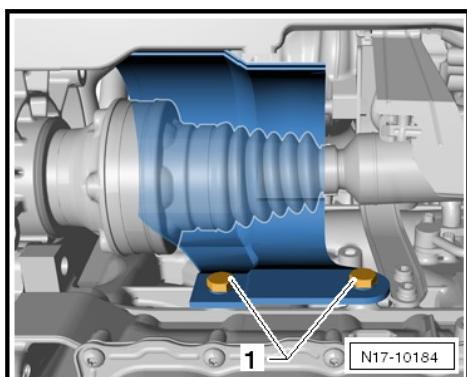
- Unbutton the heat shield -1- from the Exhaust Pressure Sensor 1 - G450-.
- Unbutton the heat shield -2- from the wires and remove.



- Remove the connector -2- from the Exhaust Pressure Sensor 1 - G450- and remove the bolt -3-.
- Cut through the control line -4- to the EGR cooler with a suitable tool (for example a knife) on the line -arrow- show in the image.
- Place the bracket with the Exhaust Pressure Sensor 1 - G450- (control line to the particulate filter remains connected).
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66 ; Noise Insulation; Overview - Noise Insulation .



- Remove the bolts -1- and remove the heat shield from the right drive axle.
- Remove the nuts -2 and 3- and remove the lower particulate filter bracket -1-.



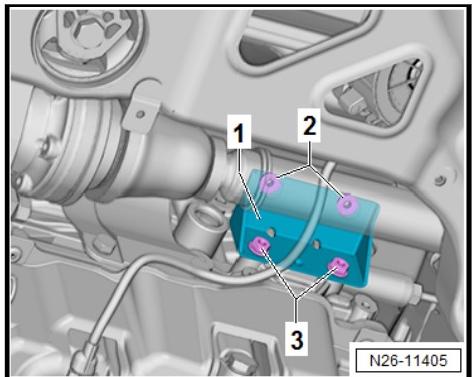


### Note

*Remove the nuts above the bracket -2- with the Wrench - Sw13 - T10384-. If necessary, the bracket can be removed only after the particulate filter is loosened.*

### Vehicles with separate NOx reduction catalytic converter

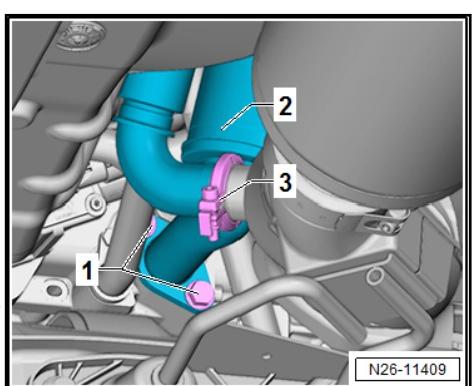
- Remove the NOx reduction catalytic converter. Refer to ["1.5 NOx Reduction Catalytic Converter, Removing and Installing", page 354](#).



N26-11405

### Continuation for All Vehicles

- Open and remove the clamp -3-.



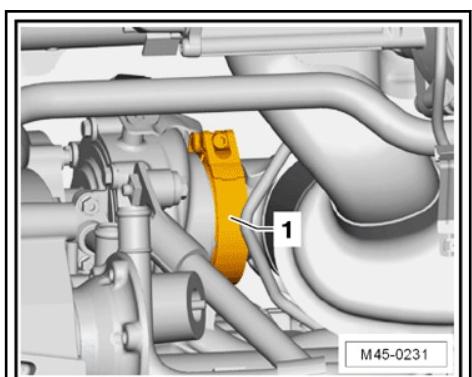
N26-11409

- Loosen the clamp -1- for the turbocharger/particulate filter connection and remove it.



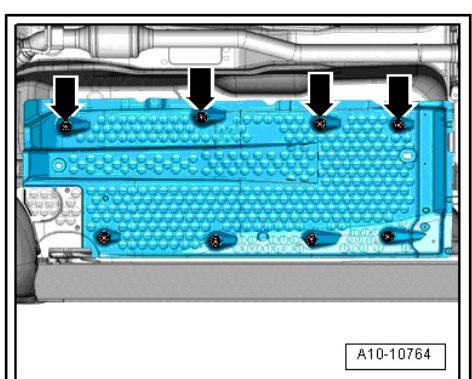
### Note

*The clamp -1- may be positioned differently. If necessary, use the socket insert for the 5 mm inner hex socket with ball head (for example, Hex Ball Socket - T10058).*



M45-0231

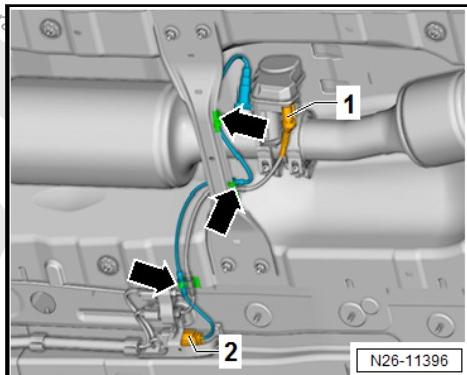
- Remove the nuts -arrows- and slightly pull the underbody cover slightly downward.
- Disconnect the »brown« connector for the Oxygen Sensor after Catalytic Converter - G130- -2-. Remove the connector from the bracket.



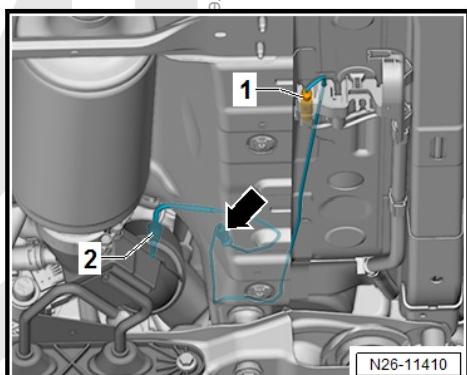
A10-10764



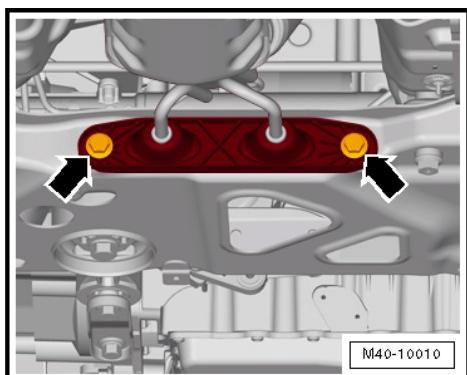
- Unbutton the heat shield and remove the connector -1- on the Exhaust Door Control Unit - J883- and guide the lines out of the clips -arrows-.



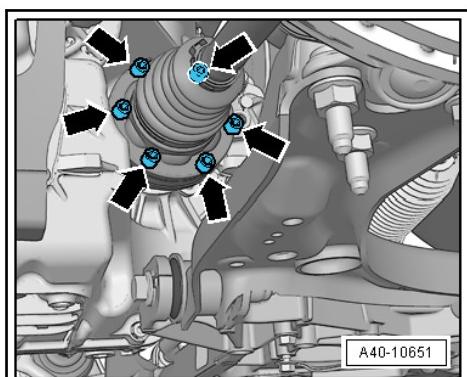
- Disconnect the connector -1-. Remove the wire from the Exhaust Gas Temperature Sensor 4 - G648- -2- on the heat shield from the clip -arrow- and the bracket, and free it up.



- Remove the bolts -arrows- from the exhaust system bracket on the subframe.



- Remove the bolts -arrows- and remove the right drive axle on the transmission. Place the drive axle downward.
- Lower the subframe approximately 6 cm. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Subframe; Overview - Subframe .





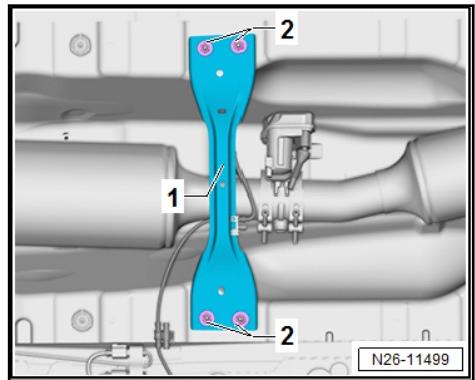
- Remove the hex nuts -2- on the front tunnel brace -1- and remove the tunnel brace.
- Remove the clamp between the NOx reduction catalytic converter and the Exhaust Door Control Unit - J883- .



### Caution

*There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:*

- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- ◆ *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*



N26-11499

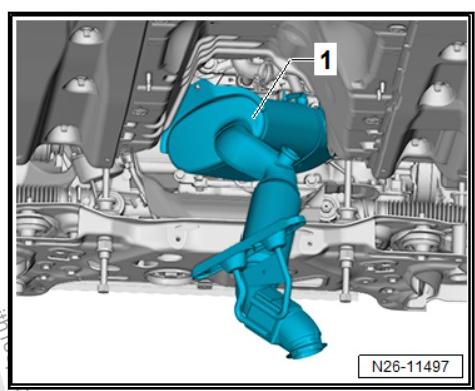
- With a second technician, remove the particulate filter with the NOx reduction catalytic converter. To do this, »remove« the particulate filter -1- from the tunnel. Be careful of the electrical wires and components.

### Installing



### Note

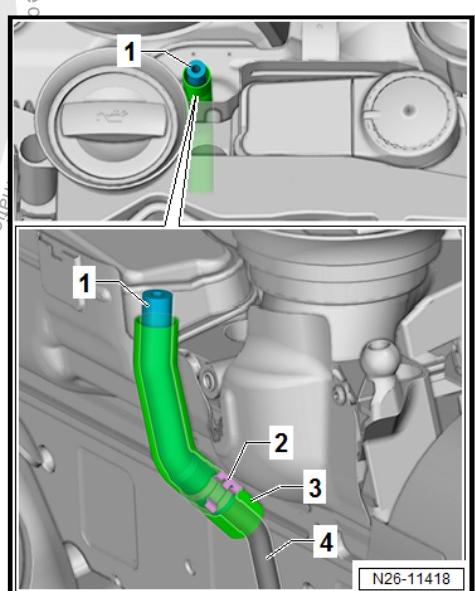
- ◆ After installing the particulate filter with NOx reduction catalytic converter, make sure it is not under stress.
- ◆ Always replace the self-locking nuts, seals, gaskets and clamps.



N26-11497

### Replace the control line hose Exhaust Pressure Sensor 1 - G450- .

- Remove the heat shield -3-.
- Open the clamp -2- and when removing, remove the cut through hose -1- from the control line -4-.



N26-11418



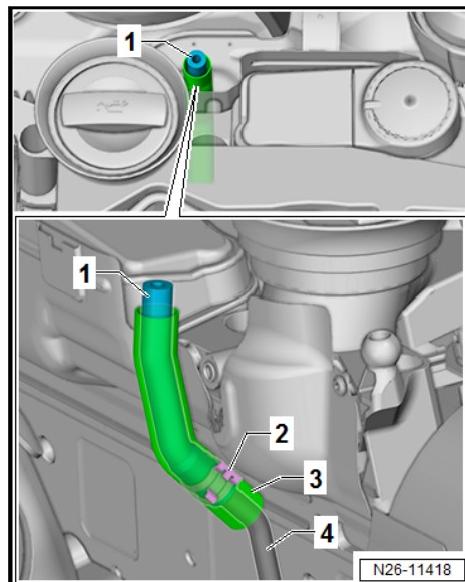
- Replace the hose -1- and secure the clamp -2-. Push the heat shield -3- over the hose and clamp.
- If necessary, carefully remove the rest of the cut control line on the Exhaust Pressure Sensor 1 - G450- .



#### Caution

*There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:*

- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- ◆ *Use the -T10404- to secure the decoupling element from stretching.*



#### Vehicles with Engine Code CBEA

- Set the particulate filter with NOx reduction catalytic converter in its installation position. Be careful of the electrical wires and components.

#### Vehicles with Engine Code CJAA

- Bring the particulate filter into the installation position. Be careful of the electrical wires and components.

#### Continuation for All Engine Codes

- Install the subframe. Refer to ⇒ Suspension, Wheels and Steering; Rep. Gr. 40 ; Subframe, Overview - Stabilizer Bar and Control Arms, .
- Install a new gasket between the NOx reduction catalytic converter and the Exhaust Door Control Unit - J883- . Refer to ⇒ [Fig. "Install the Gasket Between Exhaust Door Control Unit -J883- and the NOx Reservoir or Slip Catalyst"](#), page 357 .
- Install the new clamp between the NOx reduction catalytic converter and the Exhaust Flap Control Module - J883- .

Make sure the clamp is in the correct installation position. Refer to ⇒ [Fig. "Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst."](#), page 357 .

Tightening specification. Refer to ⇒ ["1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter"](#), page 336 .

#### Vehicles with Engine Code CJAA

- Install the new seal between the NOx reduction catalytic converter and the particulate filter.
- Install the new clamp between the NOx reduction catalytic converter and the particulate filter.

Make sure the clamp is in the correct installation position. Refer to ⇒ ["1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position"](#), page 344 .

Tightening specification. Refer to Item 18- ⇒ [Item 18 \(page 342\)](#) .



## Continuation for All Engine Codes

- Install the tunnel brace:
- Tightening specification. Refer to [⇒ “1.8 Overview - Muffler”, page 359](#).

The additional numbered procedures must be followed to ensure the particulate filter with the NOx reduction catalytic converter is installed without tension:

1. Position the lower bracket with the nuts on the cylinder block and on the particulate filter. (Do not tighten the nuts.)
  2. Position the new clamp with a new gasket between the particulate filter and turbocharger (do not tighten the clamp):
    - Make sure the clamp is in the correct installation position. Refer to [⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 344](#).
  3. Install the EGR filter. Refer to -Item 9- [⇒ Item 9 \(page 380\)](#).
  4. Position a new clamp between the particulate filter and EGR filter (do not tighten the clamp):
    - Make sure the clamp is in the correct installation position. Refer to [⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 344](#).
  5. Mount the particulate filter on the upper bracket but do not tighten the bolt yet.
- Tighten the mounting elements in the following sequence:
6. NOx reduction catalytic converter mounting on the sub-frame:
  7. Clamp between the particulate filter and turbocharger.
  8. Lower bracket to the cylinder block:
  9. Lower bracket to the particulate filter:
  10. Upper bracket to the particulate filter:
  11. Upper bracket to the cylinder head:
  12. Clamp between the particulate filter and EGR filter:
- Tightening specification. Refer to [⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 336](#).

If the particulate filter was replaced:

Remove the transport and protective packaging on the decoupling element between the particulate filter and NOx reduction catalytic converter.

Perform the rest of the installation in the reverse order of removal. Note the following:

- Make sure the line connections are secure.
- Tightening Specifications. Refer to [⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 336](#), [Overview - Particulate Filter with NOx Absorption Catalyst](#).
- Install the right driveshaft heat shield -arrows-.



- Install the right inner driveshaft from the transmission flange.  
Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 .

Vehicles with Manual Transmission:

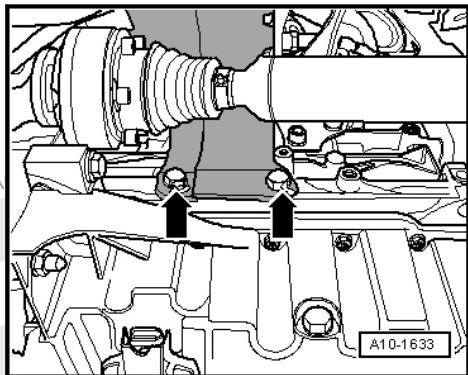
- Tightening specification. Refer to ⇒ 6-speed Manual Transmission 02Q; Rep. Gr. 34 .

Vehicles with dual-clutch transmission:

- Tightening specification. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

#### Note

If the particulate filter was replaced, an adaptation must be performed in Guided Functions. Refer to Vehicle Diagnostic Tester.



- Perform a road test. The vehicle must be aligned if the steering wheel is »crooked«. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 44 ; Vehicle Alignment .
- Install the engine cover. Refer to ["1.6 Engine Cover, Removing and Installing", page 87](#) .

## 1.5 NOx Reduction Catalytic Converter, Removing and Installing

#### Note

- ◆ This procedure applies to vehicles with a separating point between the particulate filter and the NOx reduction catalytic converter.
- ◆ On vehicles without a separating point between the particulate filter and the NOx reduction catalytic converter, both components must be removed together. Refer to ⇒ ["1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing", page 345](#) .

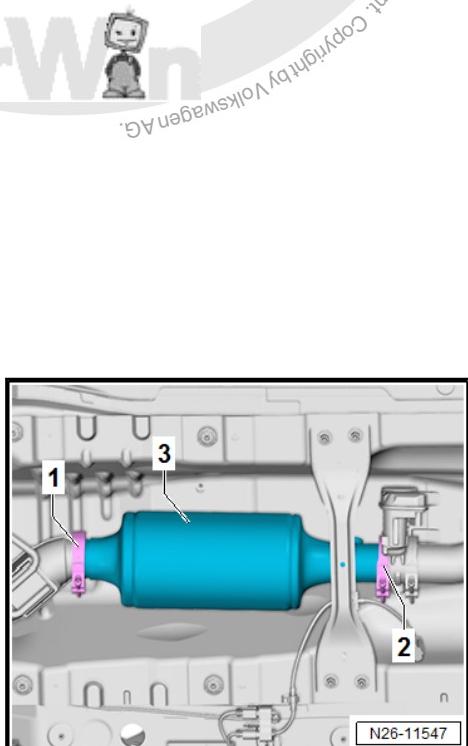
### Removing

- Remove the Oxygen Sensor after Catalytic Converter - G130- . Refer to -item 16- [Item 16 \(page 342\)](#) .
- Loosen clamp -1 and 2-, and remove the NOx reduction catalytic converter.

### Installing

#### Note

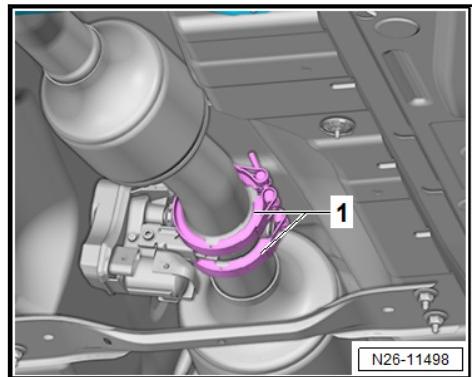
All clamps and seals must be replaced. The clamps in front of and behind the exhaust door control unit are smaller than the clamp connecting the particulate filter/NOx reduction catalytic converter. Ensure the correct allocation.



- Bring the NOx reduction catalytic converter with new seals into the installation position. Pay attention to the recesses on the rear connection location.



### Clamp Installation Position

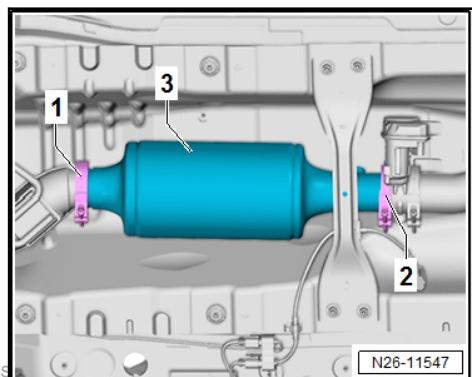


N26-11498

- Position all clamps -1- so that a collision with the underbody is avoided.
- Position and engage the clamp -2-. Then tighten to 7 Nm.
- Position and engage the clamp -1-. Then tighten to 7 Nm.
- Install the Oxygen Sensor after Three Way Catalytic Converter - G130- -item 16- [⇒ Item 16 \(page 342\)](#) .

### Tightening Specifications

- ◆ Refer to [⇒ “1.2.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter, Two-Piece \(CJAA, CBEA\)”, page 340](#)



N26-11547

## 1.6 Overview - Exhaust Flap Control Module - J883- with Slip Catalyst

erWin



## 1 - From the Reduction Catalytic Converter

### 2 - Seal

- Always replace
- Installing. Refer to [Fig. "Install the Gasket Between Exhaust Door Control Unit -J883- and the NOx Reservoir or Slip Catalyst"](#), page 357 .

### 3 - Clamp

- 7 Nm
- Always replace
- Note the installation position Refer to [Fig. "Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst"](#), page 357 .

### 4 - Exhaust Door Control Unit - J883-

- Note the installation position
- Heat shield and connector wire routing Refer to ["1.7 Exhaust System Component Line Routing"](#), page 357 .

### 5 - Slip Catalyst

- Exhaust System, Checking for Leaks. Refer to ["1.11 Exhaust System, Checking for Leaks"](#), page 366 .

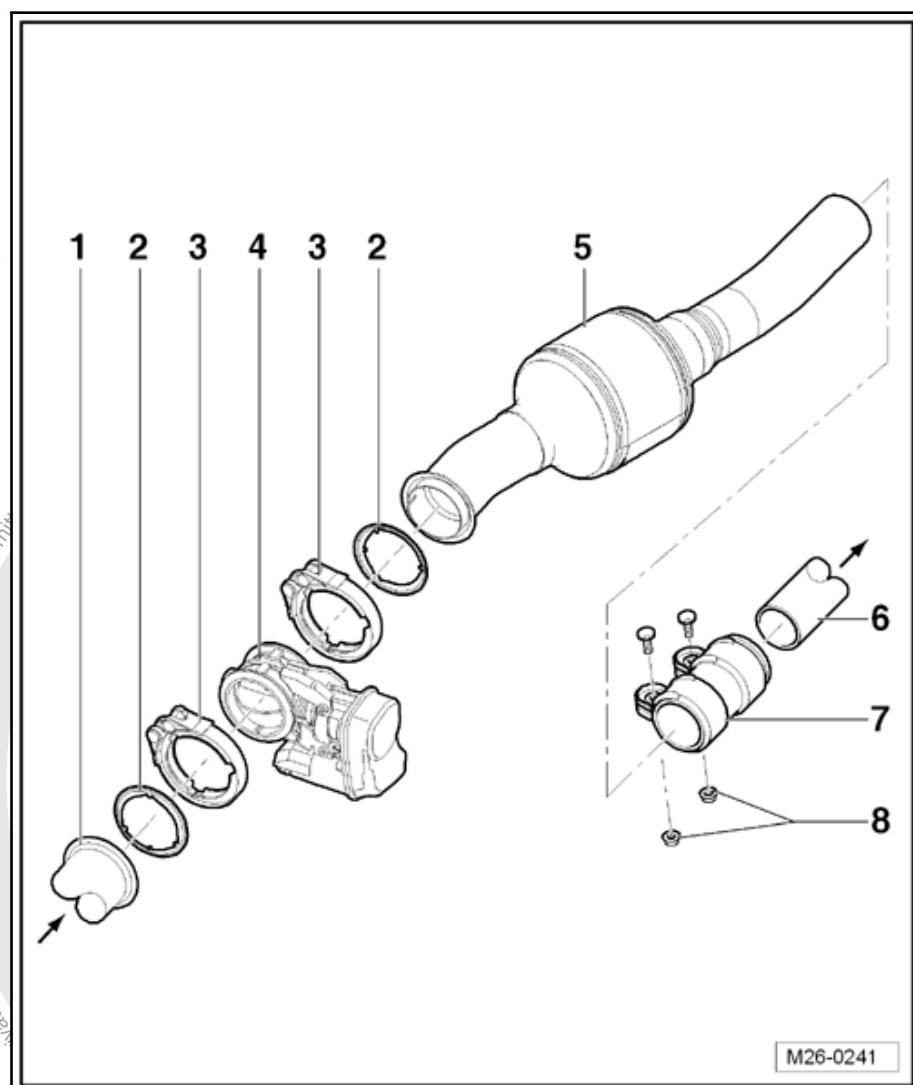
### 6 - Front Muffler

### 7 - Clamping Sleeve

- Note the installation position Refer to [Fig. "Clamping Sleeve Installation Position"](#), page 357 .
- Align the exhaust system free of stress. Refer to ["1.10 Exhaust System, Installing without Tension"](#), page 364 .
- Tighten the bolted connections evenly

### 8 - Nut

- 23 Nm

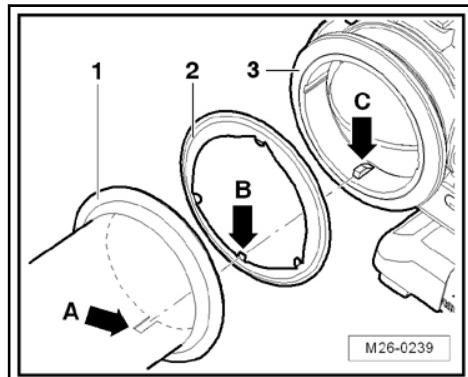


M26-0241



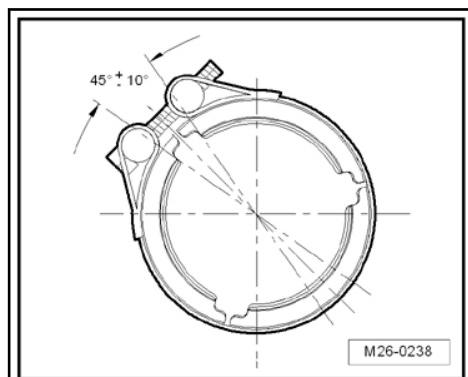
### Install the Gasket Between Exhaust Door Control Unit - J883- and the NOx Reservoir or Slip Catalyst

- Insert the gasket -2- with the angled tab -B- in the notch -A- on the NOx reservoir or slip catalyst -1-.
- Insert the Exhaust Door Control Unit - J883- -3- with the retaining tab -C- in the notch -A-.



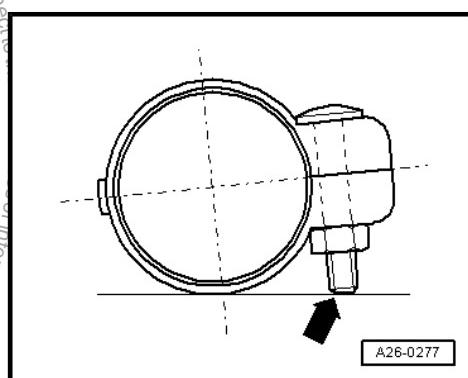
### Installation Position of the Clamps Between Exhaust Door Control Unit - J883- and NOx Reservoir or Slip Catalyst.

- Install the new clamp so the clamping bolt is opposite the Exhaust Door Control Unit - J883- housing and the  $-45 \pm 10^\circ$  angle is maintained.



### Clamping Sleeve Installation Position

- When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:
- Threaded connection points toward the right.
- Tighten the threaded connections equally to 23 Nm.



## 1.7 Exhaust System Component Line Routing

Routing Lines on the Exhaust Flap Control Module -J883-. Refer to [page 357](#)

Routing Lines for the Oxygen Sensor after Three Way Catalytic Converter -G130- and Exhaust Gas Temperature Sensor 4 -G648-. Refer to [page 358](#)

Line Routing on the Exhaust Flap Control Module



1 - Slip Catalyst

2 - NOx Reduction Catalytic Converter

3 - Direction of Travel

4 - Line

- Note the installation position
- Check for secure fit

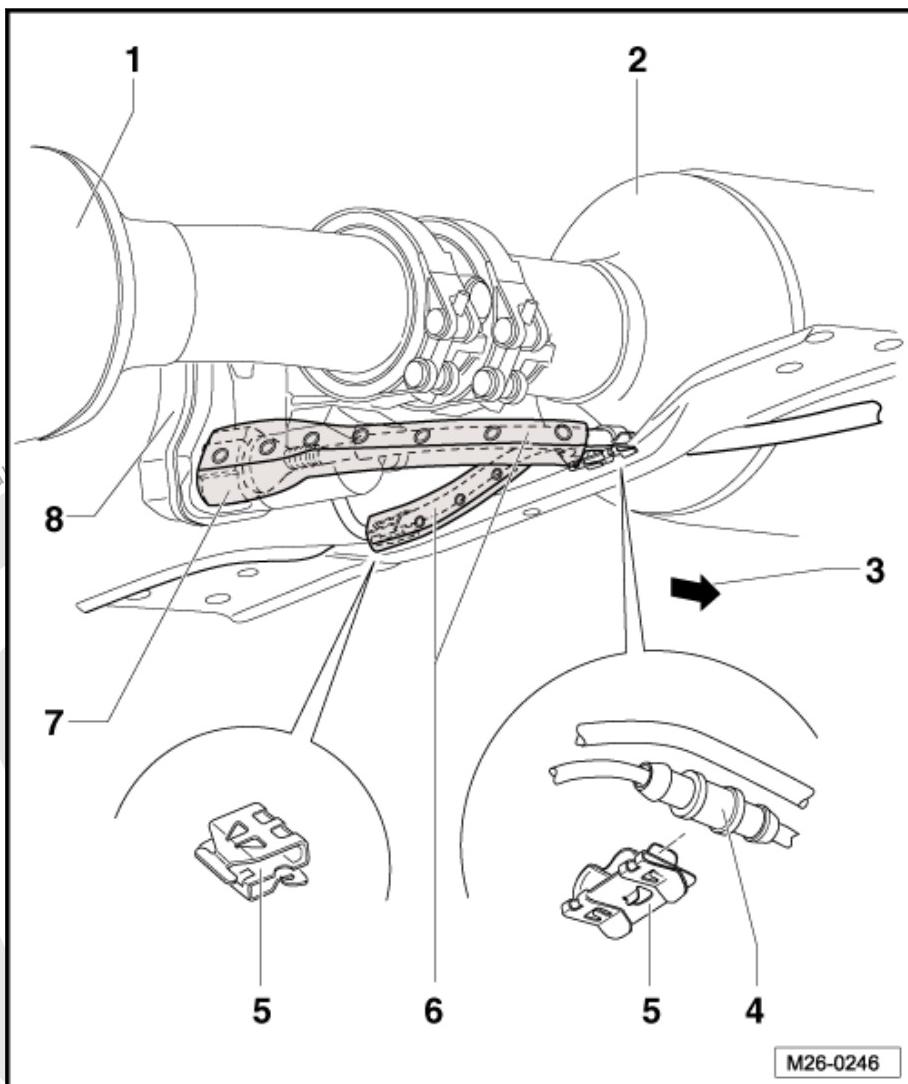
5 - Cable Bracket

6 - Heat Shield

- Replace if damaged
- Note the installation position

7 - Exhaust Door Control Unit  
- J883- Connector

8 - Exhaust Door Control Unit  
- J883-



Routing Lines for the Oxygen Sensor after Three Way Catalytic Converter -G130- and Exhaust Gas Temperature Sensor 4 -G648-



1 - Oxygen Sensor after Catalytic Converter - G130-

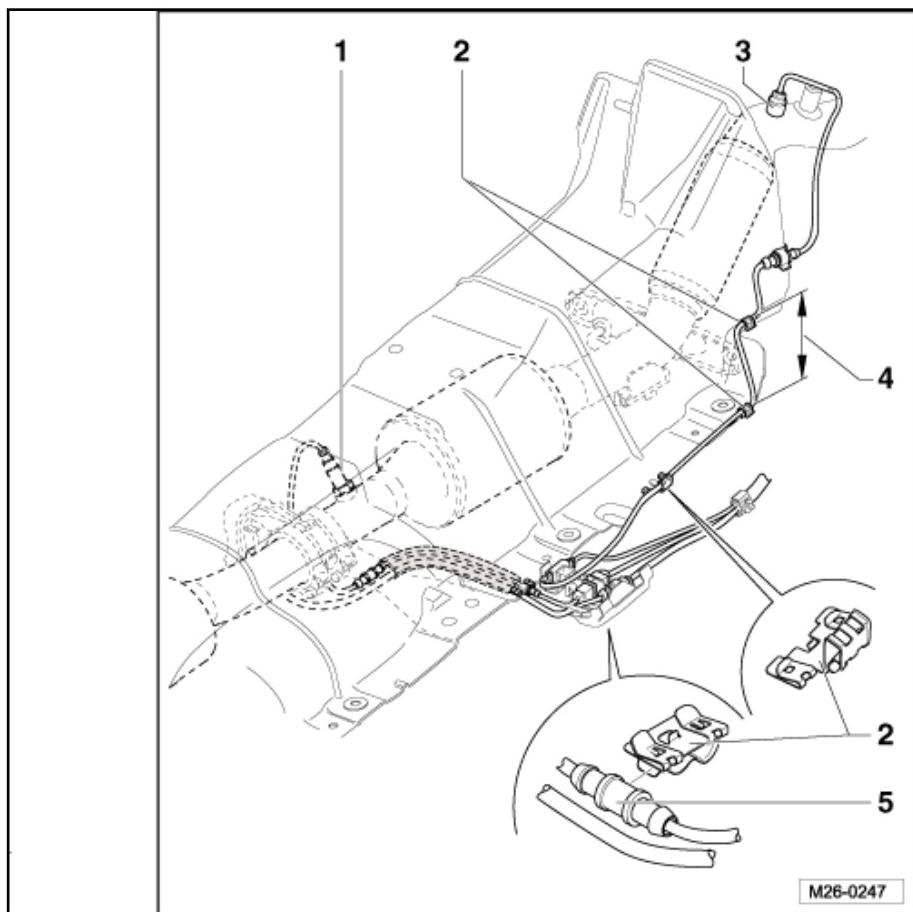
2 - Cable Bracket

3 - Exhaust Gas Temperature Sensor 4 - G648-

4 - Distance: 100 mm

5 - Line

- Note the installation position
- Check for secure fit



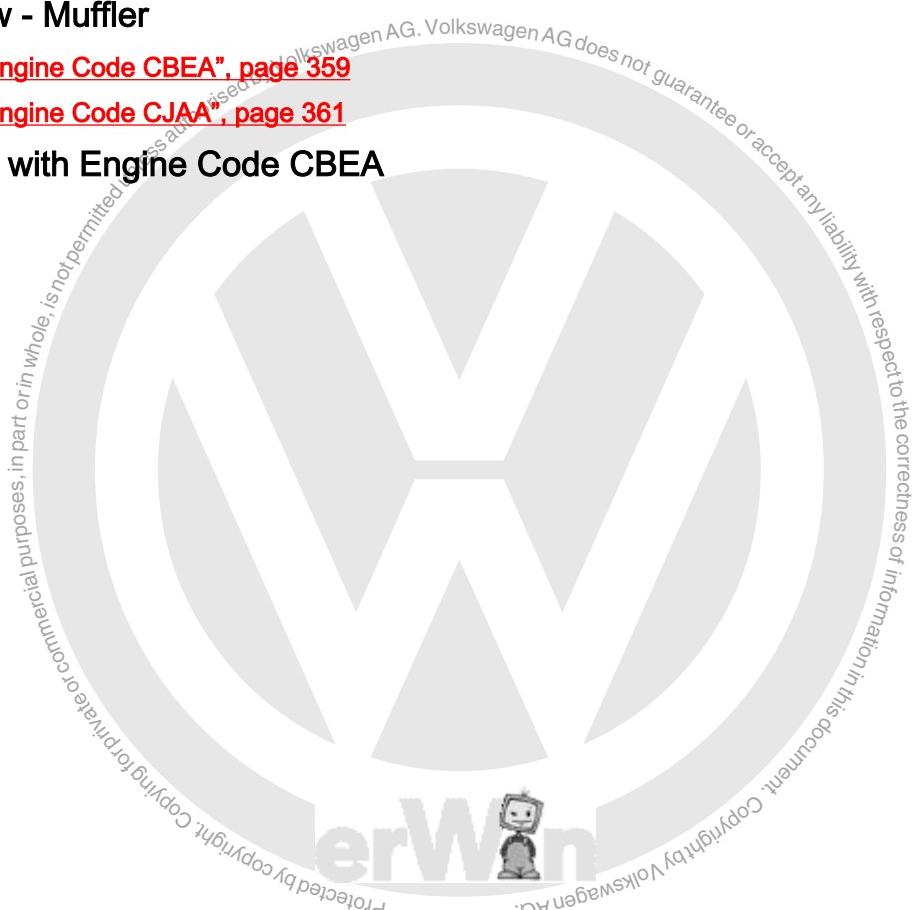
M26-0247

## 1.8 Overview - Muffler

⇒ [“1.8.1 Vehicles with Engine Code CBEA”, page 359](#)

⇒ [“1.8.2 Vehicles with Engine Code CJAA”, page 361](#)

### 1.8.1 Vehicles with Engine Code CBEA





#### 1 - Mounting Strap

- For the fuel tank  
-Item 10- [⇒ Item 10 \(page 210\)](#)

#### 2 - Mount

- Replace if damaged

#### 3 - Bolt

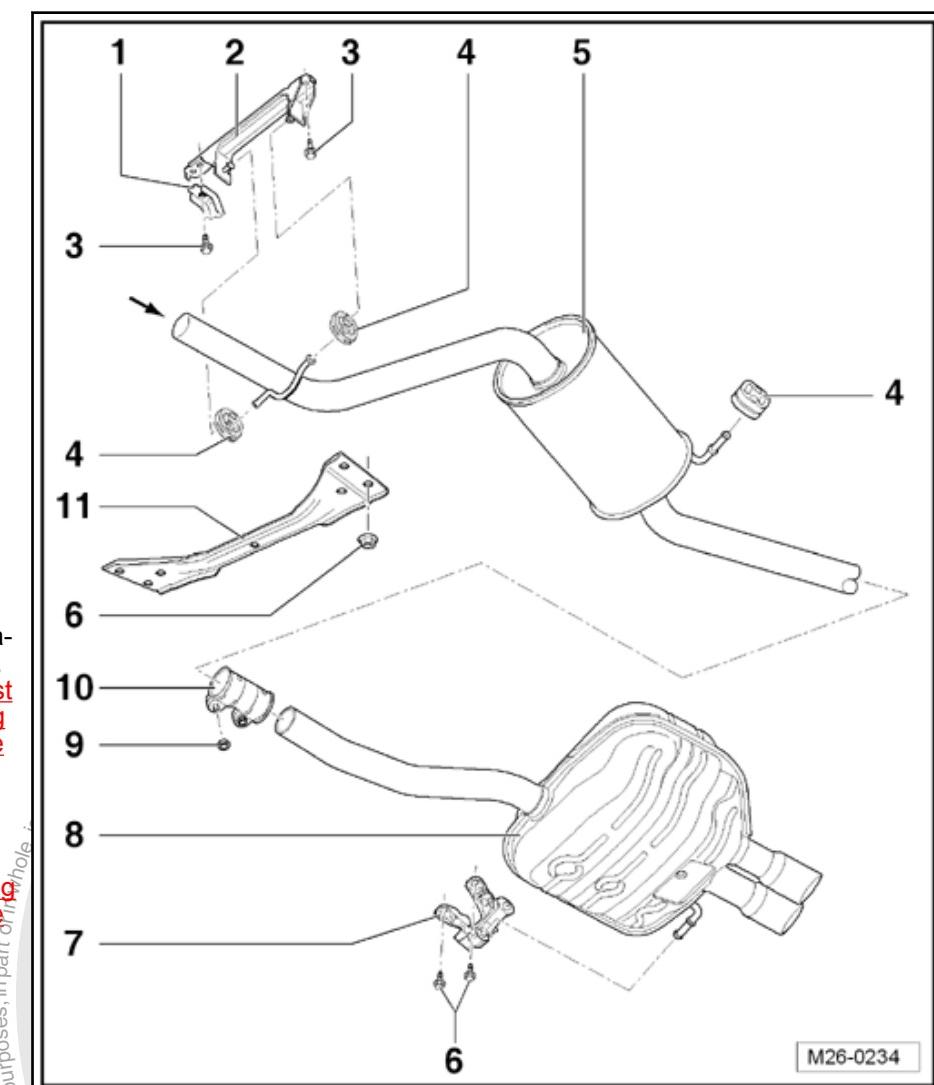
- 23 Nm
- Always replace

#### 4 - Retaining Loop

- Replace if damaged

#### 5 - Center Muffler

- Original equipment as one unit with the rear muffler
- For repairs, replace each separately
- Exhaust System, Separating and Connecting. Refer to [⇒ "1.9 Exhaust System, Disconnecting and Connecting", page 363](#).
- Align the exhaust system free of stress. Refer to [⇒ "1.10 Exhaust System, Installing without Tension", page 364](#).
- Exhaust System, Checking for Leaks. Refer to [⇒ "1.11 Exhaust System, Checking for Leaks", page 366](#).



#### 6 - Bolt

- 23 Nm

#### 7 - Mount

- Replace if damaged

#### 8 - Rear Muffler

- Original equipment as one unit with center muffler
- For repairs, replace each separately
- Exhaust System, Separating and Connecting. Refer to [⇒ "1.9 Exhaust System, Disconnecting and Connecting", page 363](#).
- Align the exhaust system free of stress. Refer to [⇒ "1.10 Exhaust System, Installing without Tension", page 364](#).
- Exhaust System, Checking for Leaks. Refer to [⇒ "1.11 Exhaust System, Checking for Leaks", page 366](#).

#### 9 - Nut

- 23 Nm

#### 10 - Repair Clamping Sleeve

- For replacing the center and rear muffler and/or exhaust pipe and rear muffler individually
- Note the installation position Refer to [⇒ Fig. "Repair Clamping Sleeve Installation Position", page 361](#).

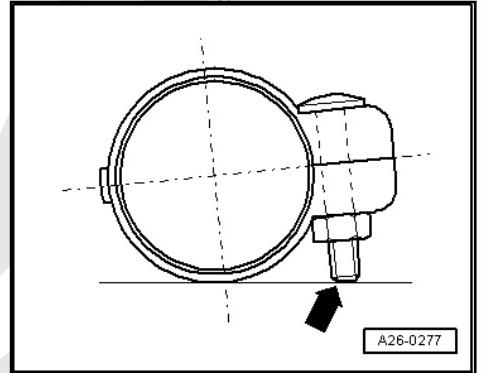


- Exhaust System, Separating and Connecting. Refer to [“1.9 Exhaust System, Disconnecting and Connecting”, page 363](#).
- Align the exhaust system free of stress. Refer to [“1.10 Exhaust System, Installing without Tension”, page 364](#).
- Tighten the bolted connections evenly

## 11 - Tunnel Brace

### Repair Clamping Sleeve Installation Position

- When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:
- Threaded connection points toward the right.
- Tighten the threaded connections equally to 23 Nm.



## 1.8.2 Vehicles with Engine Code CJAA



### 1 - Mounting Strap

- For the fuel tank  
-Item 10- [⇒ Item 10 \(page 210\)](#)

### 2 - Mount

- Replace if damaged

### 3 -

- 23 Nm
- Always replace

### 4 - Retaining Loop

- Replace if damaged

### 5 - Exhaust Pipe

### 6 - Bolt

- 23 Nm

### 7 - Mount

- Replace if damaged

### 8 - Rear Muffler

- For repairs, replace each separately
- Exhaust System, Separating and Connecting. Refer to [⇒ "1.9 Exhaust System, Disconnecting and Connecting", page 363](#).
- Align the exhaust system free of stress. Refer to [⇒ "1.10 Exhaust System, Installing without Tension", page 364](#).
- Exhaust System, Checking for Leaks. Refer to [⇒ "1.11 Exhaust System, Checking for Leaks", page 366](#).

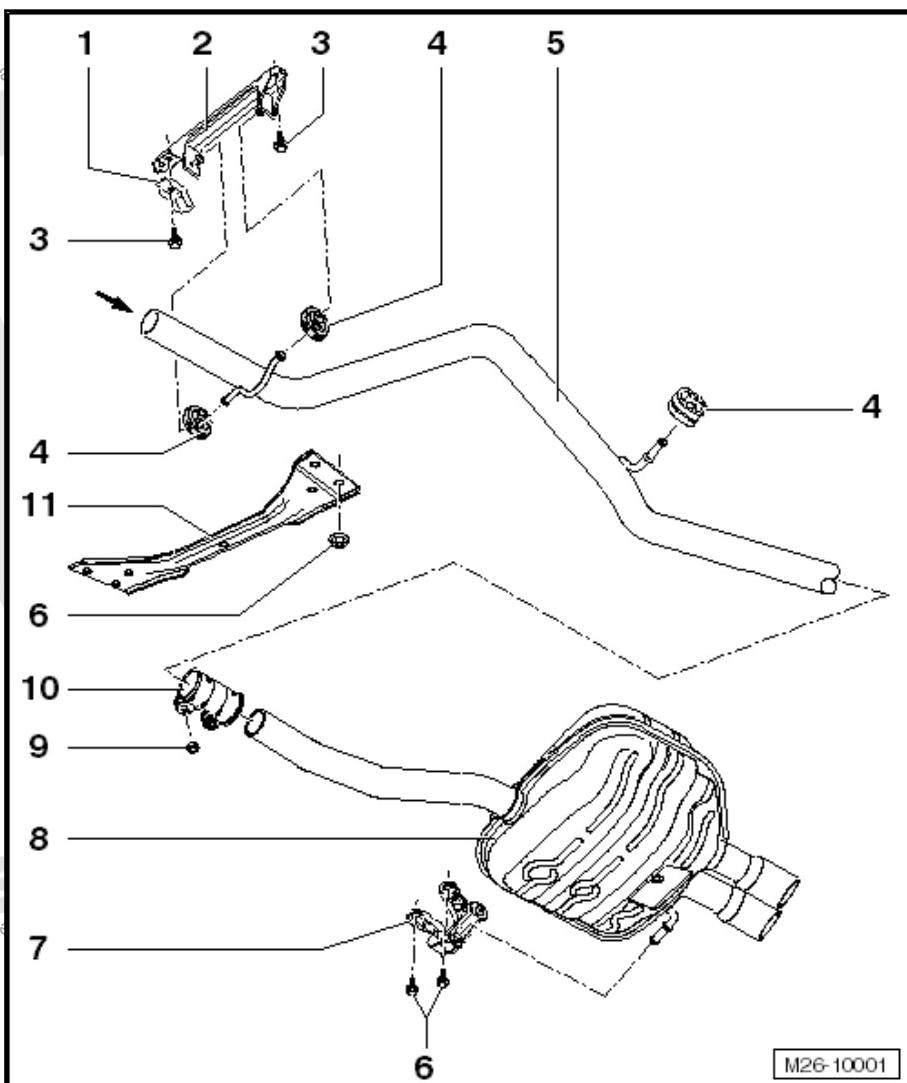
### 9 - Nut

- 23 Nm

### 10 - Repair Clamping Sleeve

- For individual replacement of exhaust pipe and rear mufflers
- Note the installation position Refer to [⇒ Fig. "Repair Clamping Sleeve Installation Position"](#), page 363.
- Exhaust System, Separating and Connecting. Refer to [⇒ "1.9 Exhaust System, Disconnecting and Connecting", page 363](#).
- Align the exhaust system free of stress. Refer to [⇒ "1.10 Exhaust System, Installing without Tension", page 364](#).
- Tighten the bolted connections evenly

### 11 - Tunnel Brace



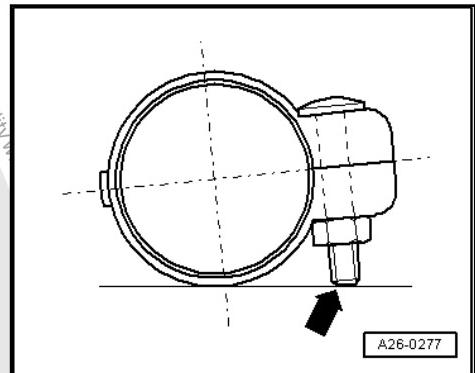


### Repair Clamping Sleeve Installation Position

- When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:

Threaded connection points toward the right.

- Tighten the threaded connections equally to 23 Nm.



## 1.9 Exhaust System, Disconnecting and Connecting

### Special tools and workshop equipment required

- ◆ Pneumatic Body Saw - VAS6780- or
- ◆ Chain Pipe Cutter - VAS6254-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331- (not illustrated)
- ◆ Protective Eyewear
- ◆ Protective clothing



### Note

- ◆ A separating point has been provided in the connecting pipe for removing, installing and individual replacement of the center or rear muffler.
- ◆ The separating point is marked an indentation around the circumference of the exhaust pipe.

### Conditions

- Engine must be cold.

### Procedure



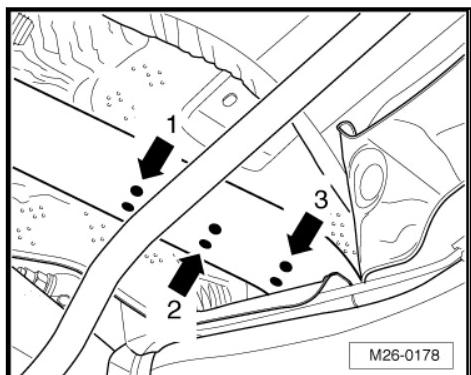
### WARNING

*To prevent injuries from metal shavings, wear protective goggles and protective clothing.*

- Cut the exhaust pipe at a right angle at the separating point -arrow 2-, for example using a -VAS6780- or - VAS6254- .

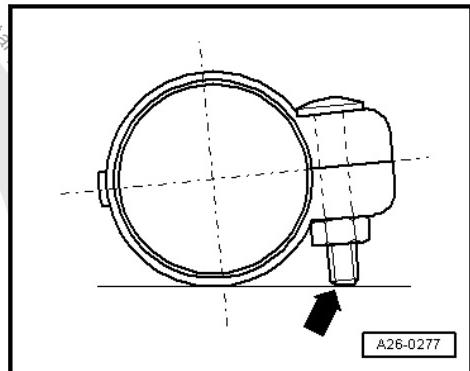
### Connecting:

- Position the repair clamping sleeve at the side marks -arrow 1 and 3- for installation.



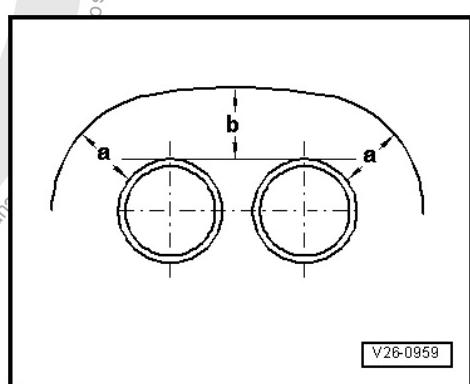


- When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:
- Threaded connection points toward the right.
- Tighten the threaded connections evenly.
- Tightening specification: 23 Nm.



### Aligning Tail Pipes

- Align rear muffler so that the distance -a- between bumper cut-out and tail pipes is uniform on left and right.



## 1.10 Exhaust System, Installing without Tension

### Special tools and workshop equipment required

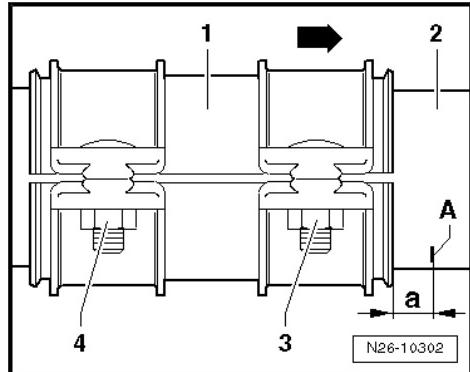
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-

### Conditions

- Engine must be cold.

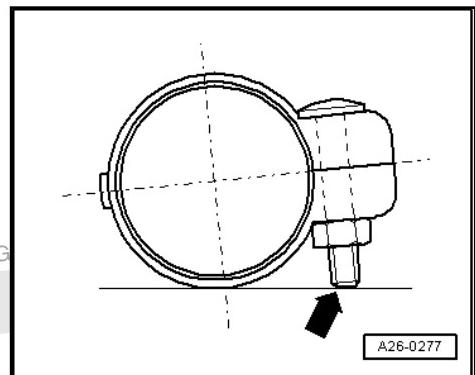
### Procedure

- Loosen the threaded connections -3 and 4- on the clamping sleeve -1- between the slip catalyst -2- and the front muffler (the -arrow- points in the direction of travel).
- Align the clamping sleeve -1- to the marking -A- on the slip catalyst -2-.
- Dimension -a- = 5 mm

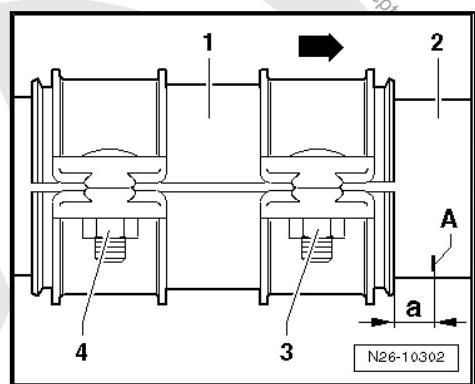




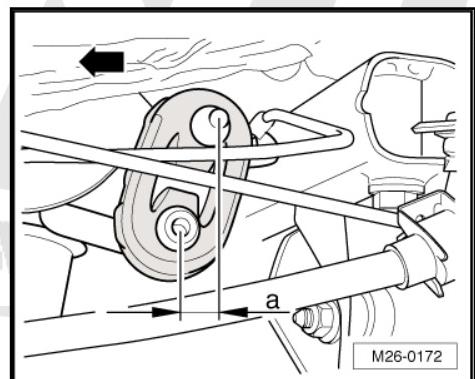
- The connections must be at the right and must not project beyond the lower edge of the clamping sleeve -arrow-.



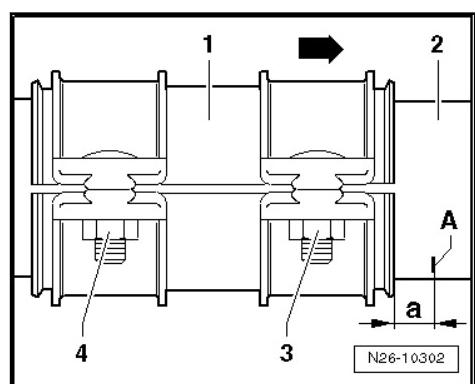
- Tighten the front connection -3- on the clamping sleeve -1- by hand.



- Push the exhaust system as far as possible forward into the double clamp until dimension -a- is reached on the retaining loop (-arrow- points in direction of travel).
- Dimension -a- 15 to 17 mm.



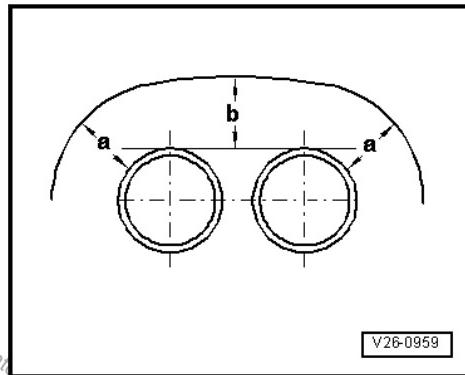
- In this position, tighten the connections -3 and 4- on the clamping sleeve -1- evenly.
- Tightening specification -Item 8- [Item 8 \(page 356\)](#).
- After tightening the clamping sleeve, check dimension -a- and correct if necessary.





## Aligning Tail Pipes

- Align rear muffler so that the distance -a- between bumper cut-out and tail pipes is uniform on left and right.



V26-0959

## 1.11 Exhaust System, Checking for Leaks

### Test Sequence

- Start the engine and let it run in idle.
- Seal the tailpipes, for example with cloth or plug, for the duration of the leak test.
- Check the connections in the exhaust system for leaks by listening.
- Repair the determined leaks.

## 1.12 Clamping Sleeve Installation Position



### Note

*Gradual introduction of clamping sleeves with continuous clamp.*

### Clamping Sleeve Tightening Specification and Installed Dimension.

Clamping sleeve -A- with two individual clamps.

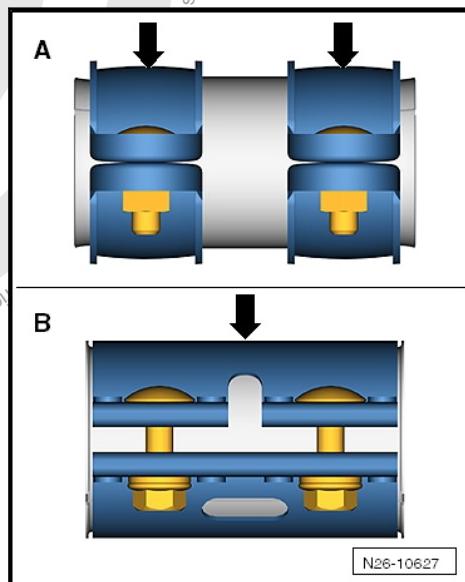
Tightening specification: 25 Nm.

Installation dimension -a- 5 mm (only for front clamping sleeve)

Clamping sleeve -B- with continuous clamp.

Tightening specification: 35 Nm

Installation dimension -a- 8.5 mm (only for front clamping sleeve)



N26-10627

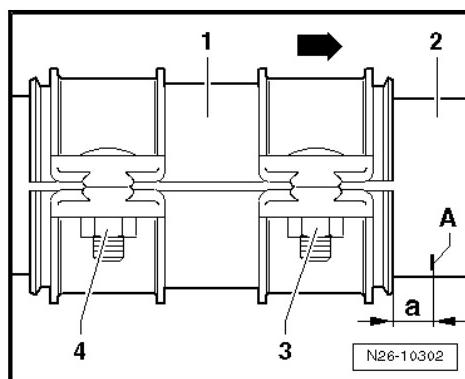
### Installation Dimension -a- for Vehicles with Marking on the Front Exhaust Pipe.

1 - Clamping Sleeve

2 - Front Exhaust Pipe

a - Installed Dimension

A - Marking

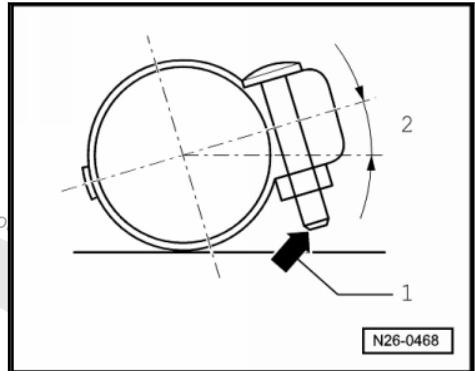


N26-10302



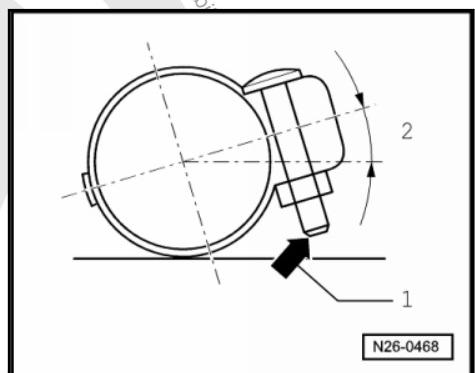
### Installed Position of the Front Clamping Sleeve

- Install the clamping sleeve so that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve.
- Threaded connection points toward the right.



### Installed Position of Rear Clamping Sleeve

- Install the clamping sleeve so that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve.
- Threaded connection points to the rear





## 2 Exhaust System, Engine Codes CBDA, CBDB and CEGA

⇒ [“2.1 Overview - Front Exhaust Pipe with Particulate Filter”](#),  
page 368

⇒ [“2.2 Particulate Filter, Removing and Installing”](#), page 371

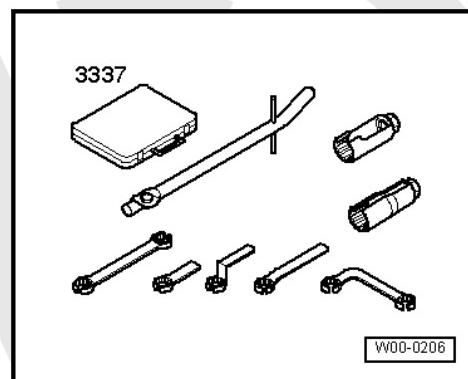
⇒ [“2.3 Overview - Muffler”](#), page 375

⇒ [“2.5 Exhaust System, Installing without Tension”](#), page 377

### 2.1 Overview - Front Exhaust Pipe with Particulate Filter

Special tools and workshop equipment required

- ◆ Ring Wrench 7-Piece Set - 3337-



#### Note

- ◆ *Exhaust Manifold, Removing and installing. Refer to ⇒ [“3.2 Overview - Turbocharger with Exhaust Manifold and Attachments”](#), page 244 .*
- ◆ *After exhaust system repairs, make sure exhaust system is not under stress and that it has sufficient clearance from the bodywork. If necessary, loosen the double clamp and align the muffler and exhaust pipe so that sufficient clearance is maintained to the body and the mountings carry even loads.*
- ◆ *Replace the self-locking nuts.*

#### Note

*If the particulate filter of the Exhaust Pressure Sensor 2 - G451- is being replaced, the Exhaust Pressure Sensor 2 - G451- must be adapted using the Vehicle Diagnostic Tester : Guided Functions, Adapt the Exhaust Pressure Sensor 2 - G451- .*



**1 - Exhaust Pressure Sensor**

**2 - G451-**

**2 - 10 Nm**

**3 - Shield**

**4 - Heated Oxygen Sensor - G39-**

- 50 Nm
- Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the probe body
- To remove, use the Ring Wrench 7-Piece Set - 3337-

**5 - Exhaust Gas Temperature Sensor 4 - G648-**

- 45 Nm
- Coat the thread on the sensor with Hot Bolt Paste - G 052 112 A3-

**6 - Seal**

- Always replace
- Note the installation position

**7 - Clamp, 7 Nm**

**8 - Exhaust Gas Temperature Sensor 3 - G495-**

- 45 Nm
- Coat the thread on the sensor with Hot Bolt Paste - G 052 112 A3-

**9 - 25 Nm**

**10 - Mount**

- Replace if damaged

**11 - Particulate Filter**

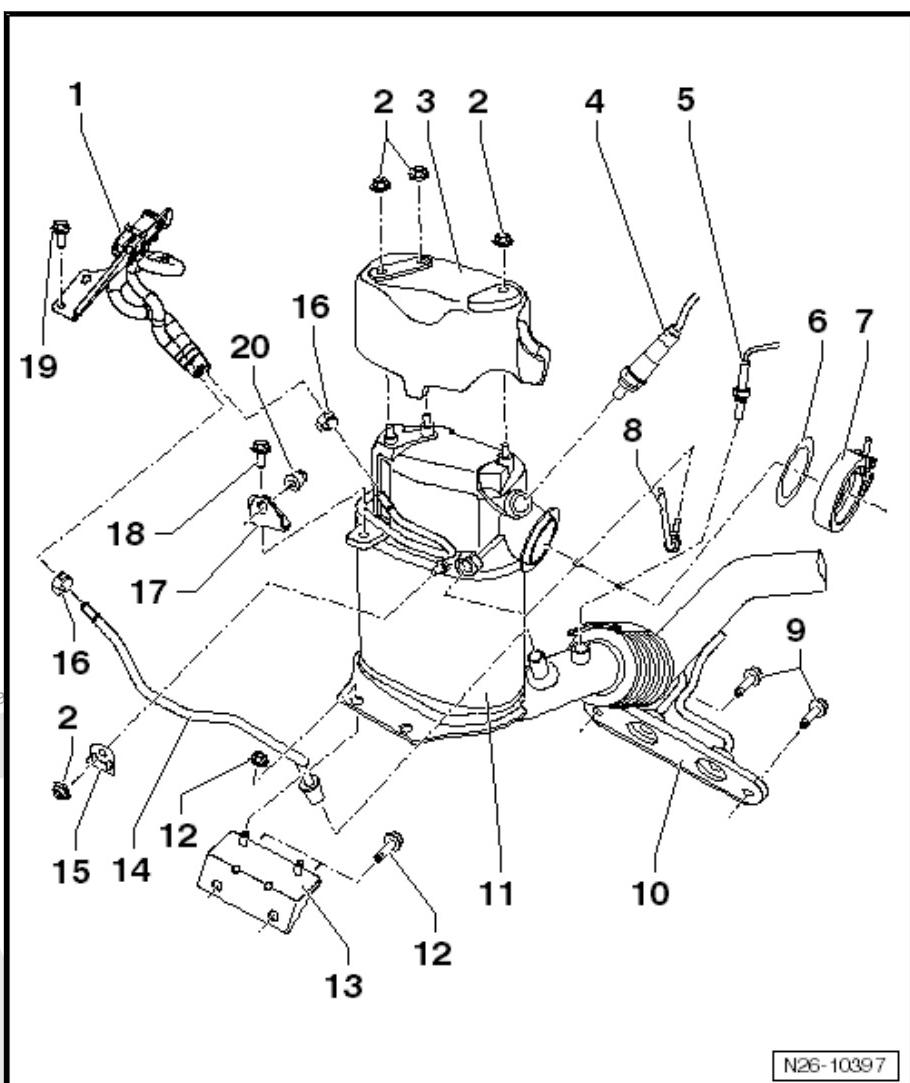
**Cau-  
tion**

**There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:**

**Do not bend the decoupling element more than 10°.**

**Do not stretch the decoupling element.**

**Do not damage the wire mesh on the decoupling element.**





**Use the Transportation Lock - T10404- to secure the decoupling element from stretching.**

- With oxidation catalytic converter and front exhaust pipe
- After replacing, the adaptation of the soot load comparison must be set to "0" using the Vehicle Diagnostic Tester "Guided Functions".
- Removing and installing. Refer to ["2.2 Particulate Filter, Removing and Installing", page 371](#).

**12 - 25 Nm**

**13 - Bracket**

- Bolted to the cylinder block

**14 - Control wire, 45 Nm**

**15 - Bracket**

- Attached to the particulate filter

**16 - Clamp**

- Always replace

**17 - Bracket**

- Attached to the cylinder head

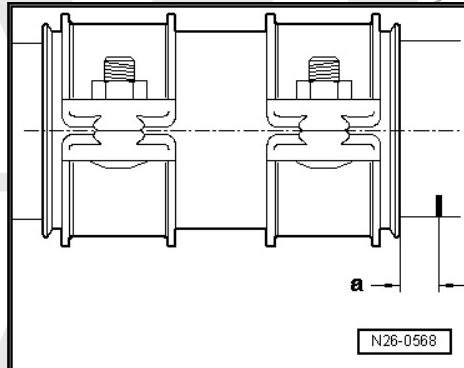
**18 - 25 Nm**

**19 - 8 Nm**

**20 - 25 Nm**

#### Clamping sleeve installation position

- Position the double clamp at a distance  $a = 5$  mm in front of the marking on the front exhaust pipe for the particulate filter.





## 2.2 Particulate Filter, Removing and Installing

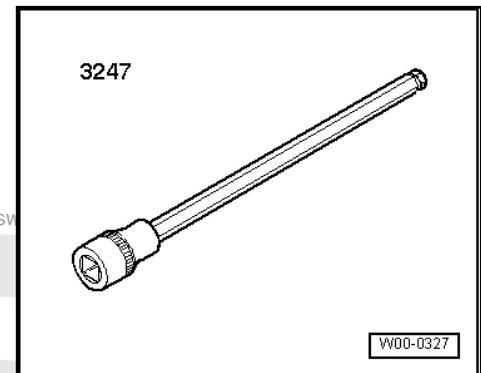


### Note

- ◆ *Exhaust Manifold, Removing and installing. Refer to ["3.2 Overview - Turbocharger with Exhaust Manifold and Attachments", page 244](#).*
- ◆ *After exhaust system repairs, make sure exhaust system is not under stress and that it has sufficient clearance from the bodywork. If necessary, loosen the double clamp and align the muffler and exhaust pipe so that sufficient clearance is maintained to the body and the mountings carry even loads.*
- ◆ *Replace the self-locking nuts.*
- ◆ *If the particulate filter of the Exhaust Pressure Sensor 2 - G451- is being replaced, the Exhaust Pressure Sensor 2 - G451- must be adapted using the Vehicle Diagnostic Tester : Guided Functions, Adapt the Exhaust Pressure Sensor 2 - G451- .*

### Special tools and workshop equipment required

- ◆ Hex Ball Socket - 3247-

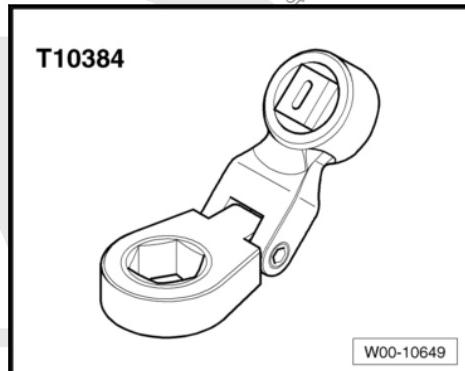


- ◆ Torque Wrench 1331 5-50Nm - VAG1331-

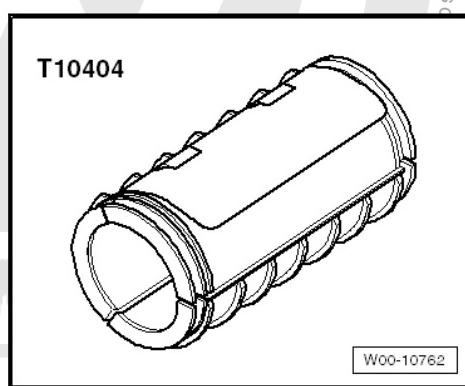




- ◆ Wrench - Sw13 - T10384-

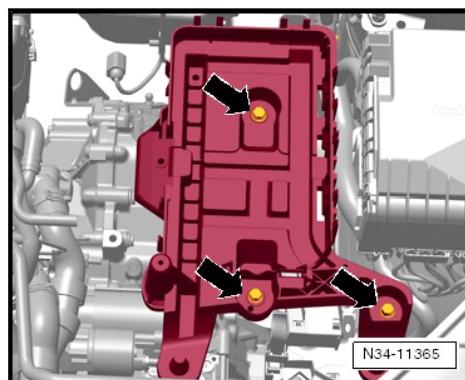


- ◆ Transportation Lock - T10404-

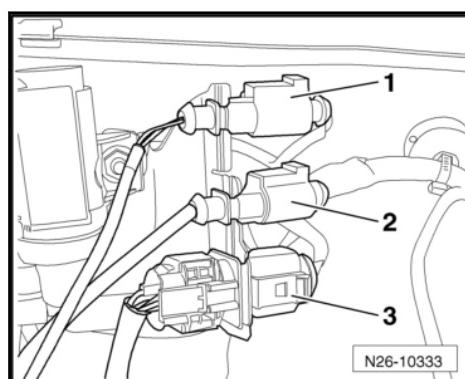


## 2.2.1 Removing

- Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- Remove the bolts -arrows- and remove the battery mount -1-.
- Remove the air filter housing. Refer to [“3.15 Overview - Air Filter”, page 311](#) .

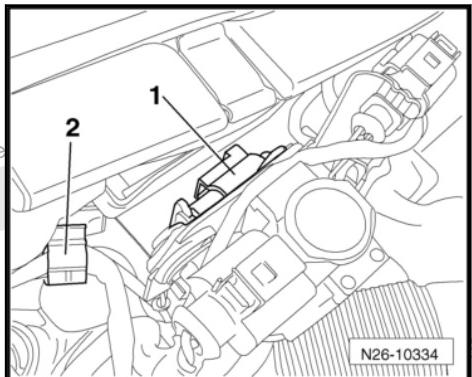


- Disconnect the connector for the Heated Oxygen Sensor - G39 - 3- as well as the connector for the Exhaust Gas Temperature Sensor 4 - G648- -2-.

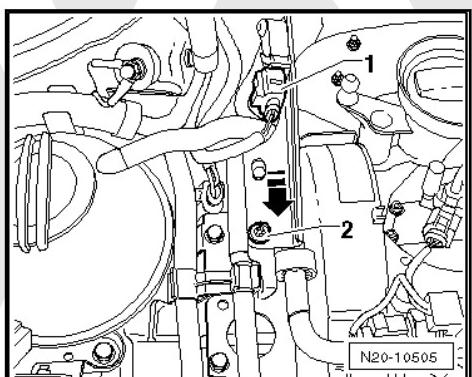




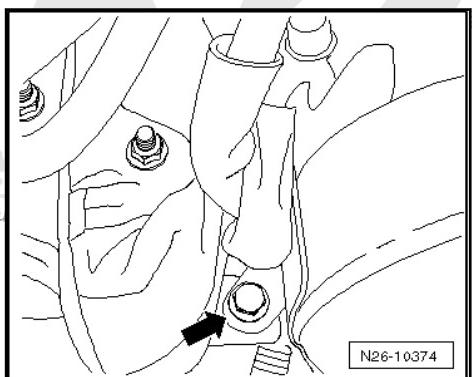
- Disconnect the connector for the Exhaust Gas Temperature Sensor 3 - G495- -1- (attached behind the bracket).
- Disconnects from the retainers and guide the wires out of the retainers on the plenum chamber bulkhead -2- and turbocharger.



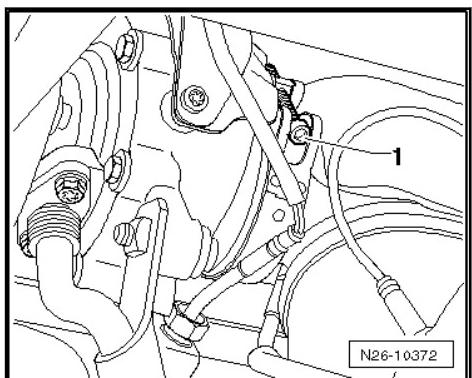
- Disconnect the connector -1-, remove the screw -2- and remove the bracket for Exhaust Pressure Sensor 2 - G451- including the sensor by pushing it in the direction of travel.
- Lay the Exhaust Pressure Sensor 2 - G451- on the particulate filter.



- Remove the screw -arrow- on the top bracket for the particulate filter.
- Remove the noise insulation. Refer to ⇒ Rep. Gr. 50 .
- Remove the subframe with the steering gear. Refer to  
 ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Subframe;  
 Subframe with Hydraulic Steering Gear, Removing and Installing .



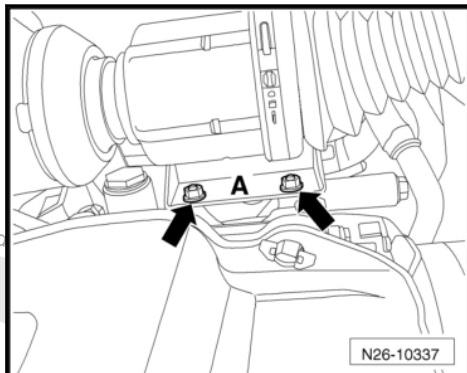
- Loosen the clamp -1- between the particulate filter and the turbocharger.
- Remove the nuts above the particulate filter bracket using the Wrench - Sw13 - T10384-





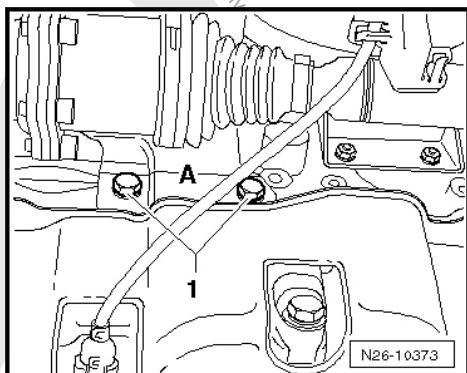
- Remove the nuts -arrows- on the particulate filter bracket -A- from the crankcase. Leave the bracket on the crankcase.

**FWD Vehicles:**



- Remove the bolts -1- from the heat shield -A- above the right axle shaft and remove the heat shield.

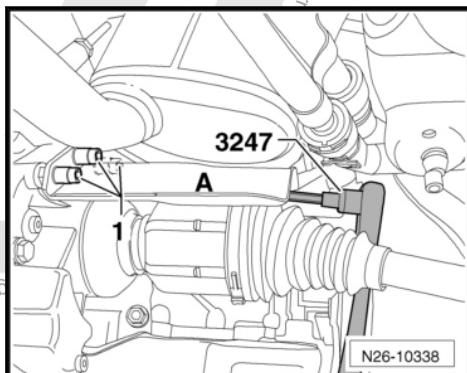
**AWD vehicles:**



- Remove the bolts -1- from the shield -1- above the right axle shaft using a Hex Ball Socket - 3247-. Push the particulate filter upward, if necessary, in order to be able to reach the rear threaded connection.

**Continuation for All Vehicles:**

- Loosen the clamp on the exhaust pipe. Leave it in its position.



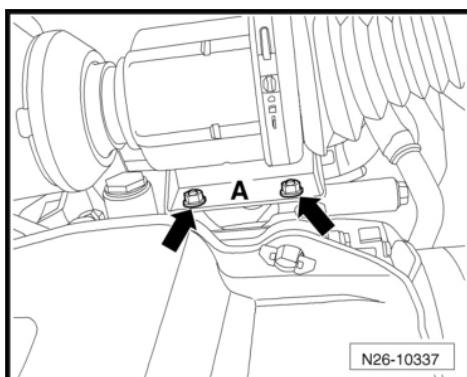
- Remove the particulate filter bracket -A-.
- Slide the clamp toward the exhaust pipe.



**Caution**

*There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:*

- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- ◆ *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*



- Remove the particulate filter and exhaust pipe downward. Be careful of the electrical wires and components.



## 2.2.2 Installing



### Caution

*There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:*

- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- ◆ *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*

- Mount the particulate filter bracket on the crankcase and install the nuts by hand.
- Mount the particulate filter on the bracket.
- Secure the exhaust pipe to the driveshaft or to the body.
- Install the screw on the particulate filter bracket by hand.
- Slide the double clamp into position on the exhaust pipe.
- Guide the temperature sensor wires upward.
- Position the clamp on the turbocharger and tighten it.
- Tighten the screws in the following sequence:
  1. Lower particulate filter bracket to crankcase.
  2. Particulate filter to lower particulate filter bracket, use the Wrench - Sw13 - T10384- .
  3. Particulate filter to upper particulate filter bracket
- Install the axle shaft heat shield with Hex Ball Socket - 3247- .
- Mount the right axle shaft joint on the bevel box. Refer to => Suspension, Wheels, Steering; Rep. Gr. 40 .
- Install the subframe with the steering gear. Refer to => Suspension, Wheels, Steering; Rep. Gr. 40 ; Subframe; Subframe with Hydraulic Steering Gear, Removing and Installing .
- Install the suspended mounting for the exhaust pipe to the subframe.
- Tighten the double clamp on the exhaust system.

## 2.3 Overview - Muffler

Exhaust Pipe, Disconnecting. Refer to [“2.4 Exhaust Pipe, Disconnecting”, page 376](#).



**1 - 25 Nm**

Always replace

**2 - Retaining Ring**

Replace if damaged

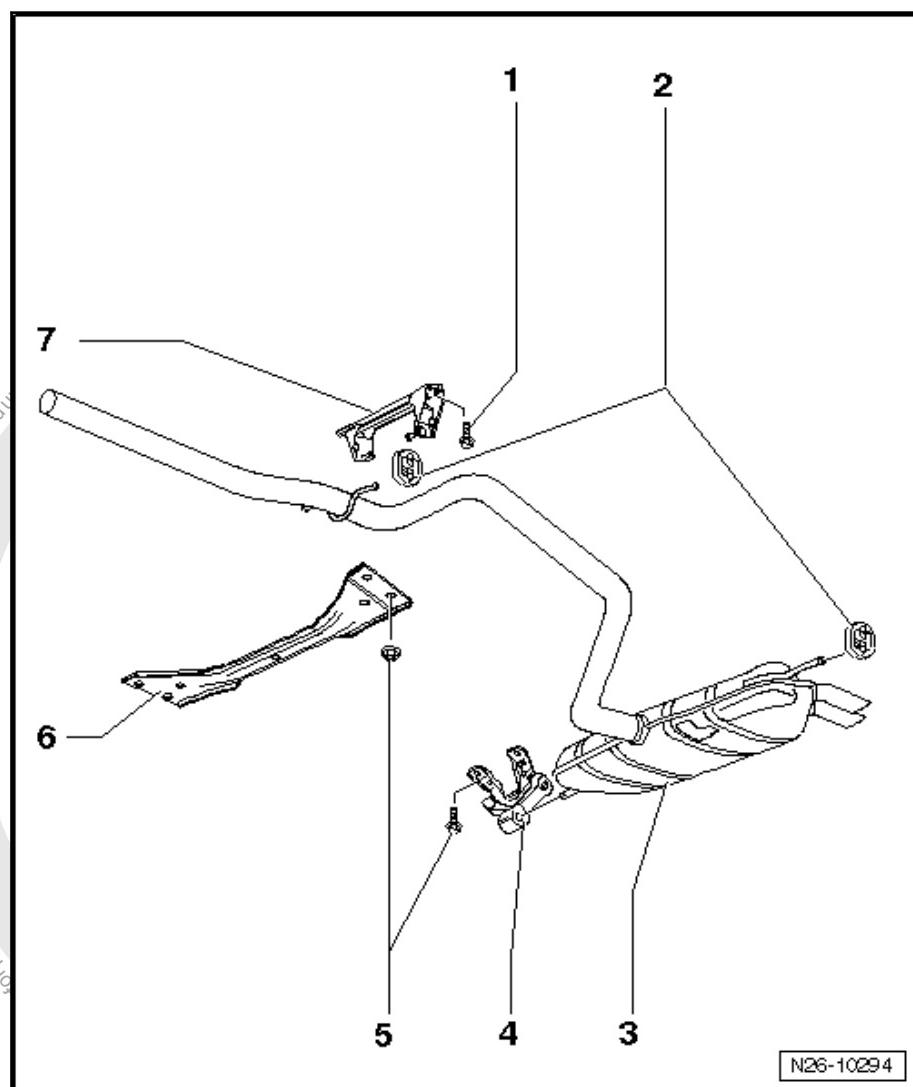
**3 - Rear Muffler**

**4 - Mount**

Replace if damaged

**5 - 25 Nm**

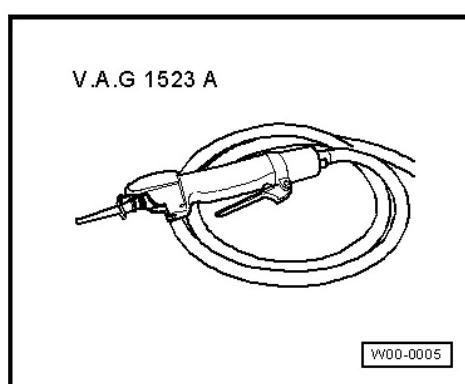
**6 - Tunnel Brace**



## 2.4 Exhaust Pipe, Disconnecting

Special tools and workshop equipment required

- ◆ Pneumatic Body Saw - VAS6780-

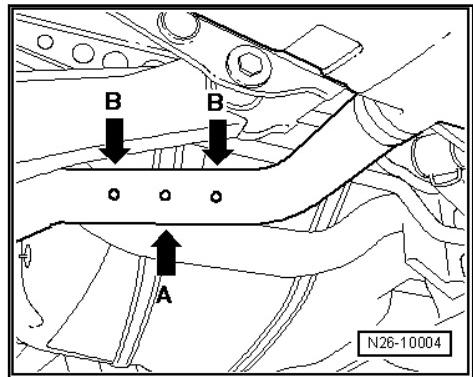




- Disconnect the exhaust pipe at right angle at the separation point -A-.
- During installation, position the repair double clamp at side markings -B- .

Tightening specification:

- ◆ M8 = 25 Nm
- ◆ M10 = 40 Nm

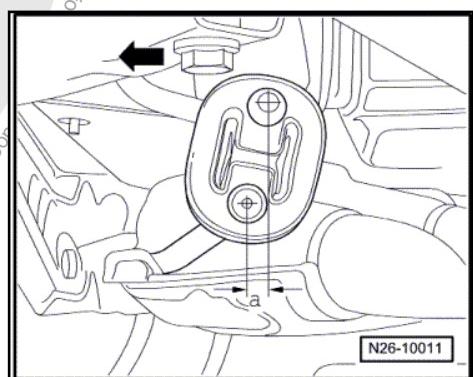
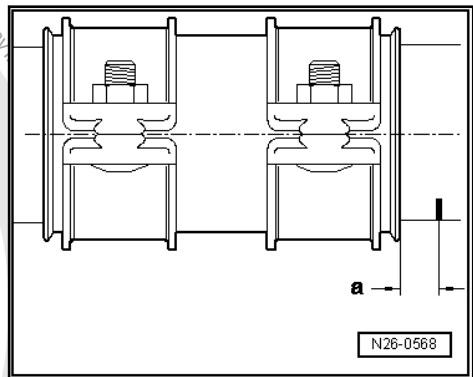


## 2.5 Exhaust System, Installing without Tension

- Engine must be cold.
- Loosen the double clamp threaded connection between the catalytic converter and the front muffler.
- Position the double clamp at a distance -a- = 5 mm from the marking on the catalytic converter pipe and gently tighten the front threaded connection.
- Push the rear muffler as far forward into the double clamp until dimension -a- reaches 15-17 mm between the suspended mount/body and the suspended mount/rear muffler.

The -arrow- points in the direction of travel.

- Align rear muffler horizontally.
- Tighten the threaded connections of the double clamp in this position. Tightening specification: 25 Nm.
- After tightening the double clamp, check dimension -a- and correct if necessary.





### 3 Exhaust Gas Recirculation (EGR)

- ⇒ “3.1 Overview - Exhaust Gas Recirculation (EGR)”, page 378
- ⇒ “3.2 EGR Filter, Removing and Installing”, page 381
- ⇒ “3.3 EGR Cooler, Removing and Installing, Engine Codes CBDA, CBDB, CEGA”, page 383
- ⇒ “3.4 EGR Cooler, Removing and Installing, Engine Code CJAA, CBEA”, page 385
- ⇒ “3.5 EGR Cooler, Checking for Leaks”, page 387
- ⇒ “3.6 EGR Temperature Sensor, Removing and Installing”, page 390
- ⇒ “3.7 EGR System, Cleaning”, page 393

#### 3.1 Overview - Exhaust Gas Recirculation (EGR)

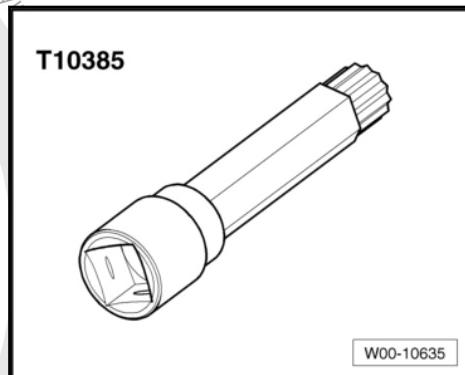
⇒ “3.1.1 Overview - Exhaust Gas Recirculation, Engine Codes CBDA, CBDB, CEGA”, page 378

⇒ “3.1.2 Overview - Exhaust Gas Recirculation, Engine Codes CJAA, CBEA”, page 379

##### 3.1.1 Overview - Exhaust Gas Recirculation, Engine Codes CBDA, CBDB, CEGA

Special tools and workshop equipment required

- ◆ Socket - Xzn 10 - T10385





1 - 20 Nm

**2 - Connecting Pipe**

- Removing and installing with the Socket - Xzn 10 - T10385-

**Caution**  
*Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.*

3 - 10 Nm

**4 - To EGR Valve - N18- ~~Item 12 (page 308)~~**

**5 - Seal**

- Replace

**6 - Cable Guide**

**7 - Radiator**

- For the EGR
- With a bypass door
- Checking the EGR cooler for leaks. Refer to ["3.5 EGR Cooler, Checking for Leaks", page 387](#).

**8 - From the exhaust manifold**

**9 - Connecting Pipe**

**10 - Vacuum Line**

- Connection diagram for vacuum hoses. Refer to ["4.5 Vacuum Hose Connection Diagram", page 271](#).

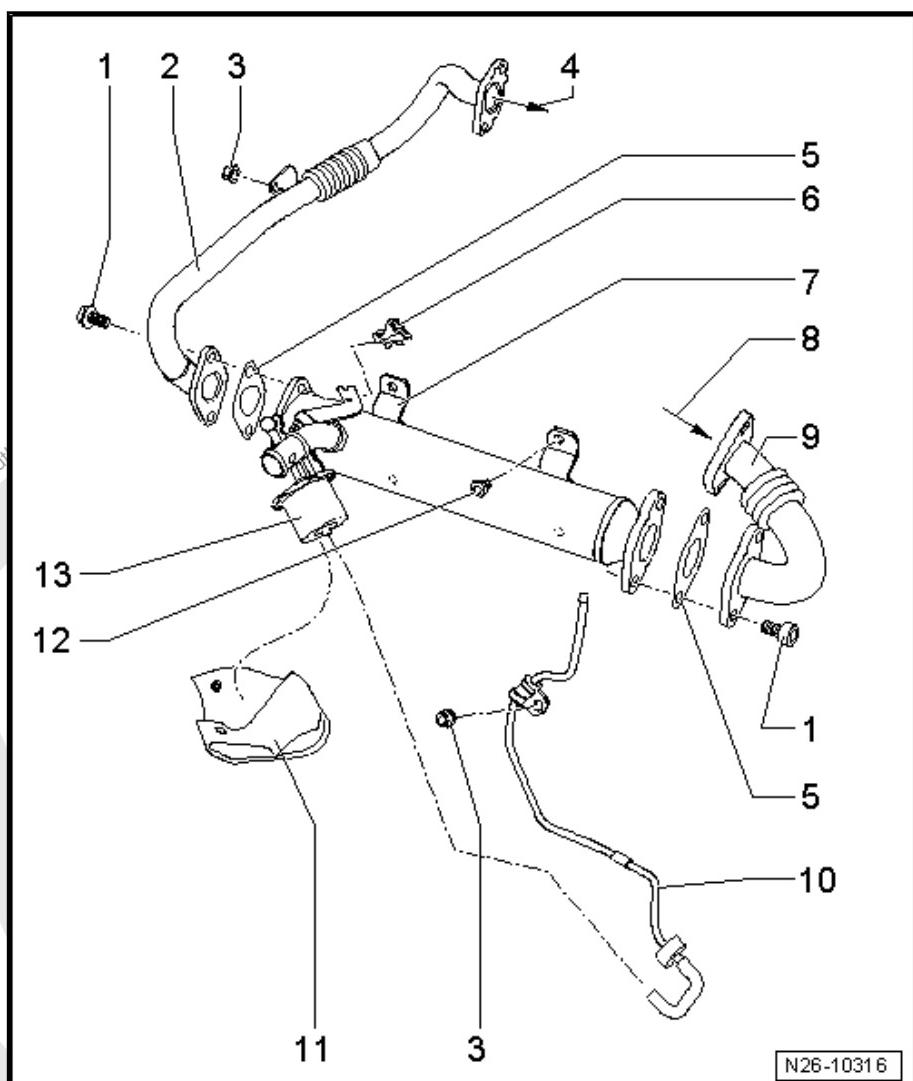
**11 - Heat Shield**

- Replace if damaged

12 - 10 Nm

**13 - Vacuum Diaphragm**

- to the bypass door change over



N26-10316

### 3.1.2 Overview - Exhaust Gas Recirculation, Engine Codes CJAA, CBEA



**Note**

- ◆ Replace the self-locking nuts, the seals, the gaskets and clamps.
- ◆ Hoses are secured with spring clips.
- ◆ Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.



### 1 - Gasket

- Always replace
- Note the installation position

### 2 - Connecting Pipe

- For removing and installing, also loosen the connections -item 33- [⇒ Item 33 \(page 247\)](#) on the turbocharger

### 3 - To the Connection on the Turbocharger

- Item 33- [⇒ Item 33 \(page 247\)](#)

### 4 - Seal

- Replace if damaged

### 5 - Bolt

- 8 Nm

### 6 - Cooler

- For the EGR
- Checking the EGR cooler for leaks. Refer to [⇒ "3.5 EGR Cooler, Checking for Leaks", page 387](#).

### 7 - Nut

- 23 Nm
- Installed on the hex stud bolt -item 17- [⇒ Item 17 \(page 246\)](#) on the turbocharger

### 8 - Control Line

- 23 Nm
- Do not change the shape of the control line
- For Exhaust Pressure Sensor 1 - G450-, component location: near the oil filler tube
- Remove the Valve 2 for EGR - N213- -item 14- [⇒ Item 14 \(page 380\)](#)
- To loosen at the housing -item 16- [⇒ Item 16 \(page 381\)](#) remove the exhaust gas recirculation filter -item 9- [⇒ Item 9 \(page 380\)](#)
- Install without tension

### 9 - Filter

- For the EGR

### 10 - Nut

- 23 Nm
- Secure on the exhaust manifold with the heat shield -item 16- [⇒ Item 16 \(page 246\)](#)

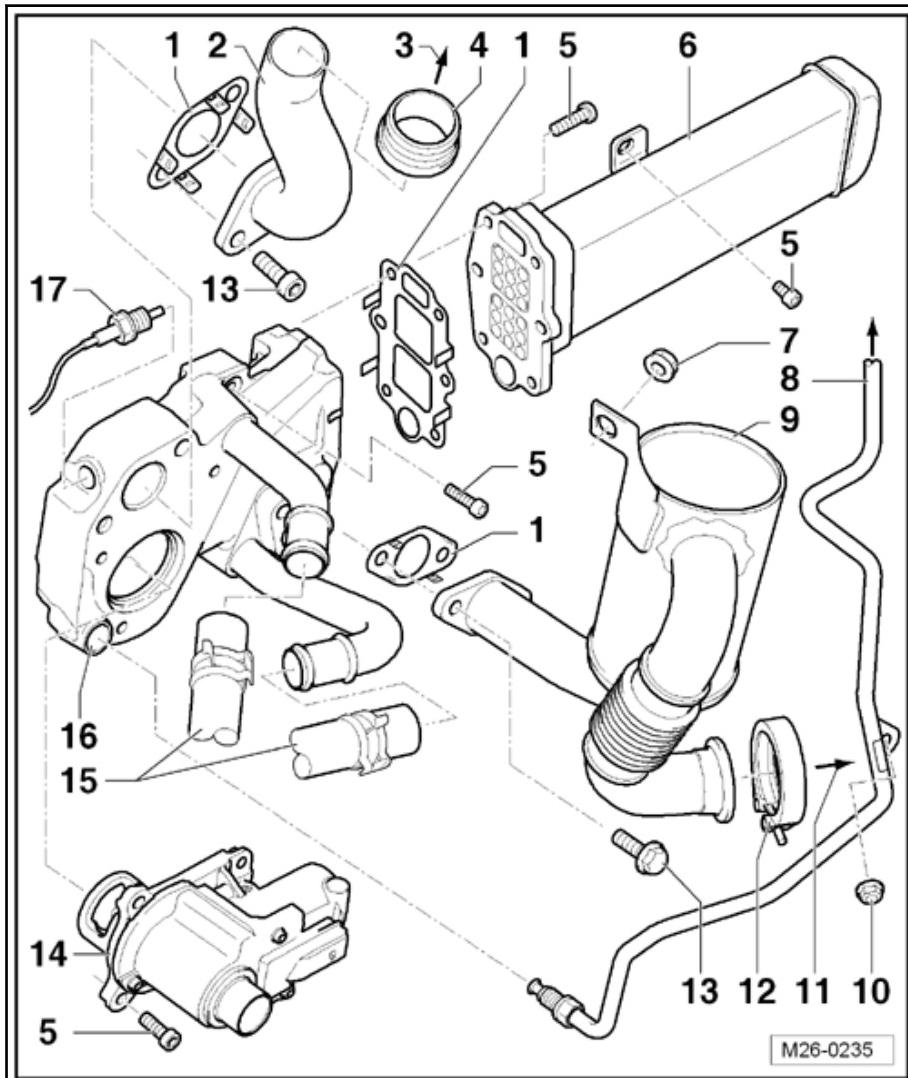
### 11 - To the Particulate Filter

### 12 - Clamp

- 3.5 Nm
- Always replace
- Note the installation position. Refer to [⇒ "1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position", page 344](#).

### 13 - Bolts

- 23 Nm





#### 14 - Valve 2 for EGR - N213-

- Mark the installation position before removal
- Before installing thoroughly clean the fitting area on the valve and housing and lubricate lightly if necessary.

#### 15 - Coolant Hose

- Check for secure fit
- Coolant Hose Connection Diagram. Refer to ["1.4 Coolant Hose Connection Diagram", page 183](#).

#### 16 - Housing

- For the EGR

#### 17 - EGR Temperature Sensor - G98-

- 20 Nm
- Cut out and replace the gasket if it is damaged or leaks
- Follow the tightening specification
- EGR Temperature Sensor - G98-, Removing and Installing. Refer to ["3.6 EGR Temperature Sensor, Removing and Installing", page 390](#).

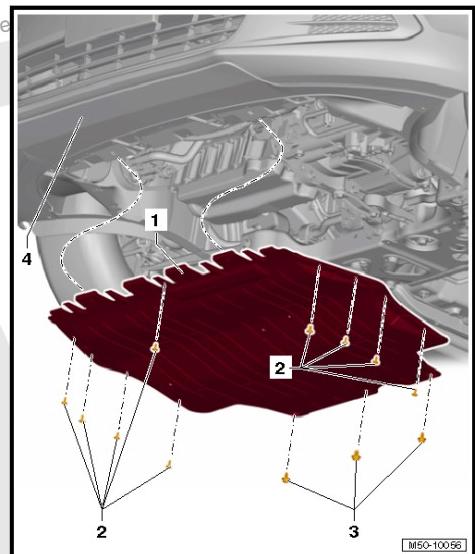
## 3.2 EGR Filter, Removing and Installing



### Note

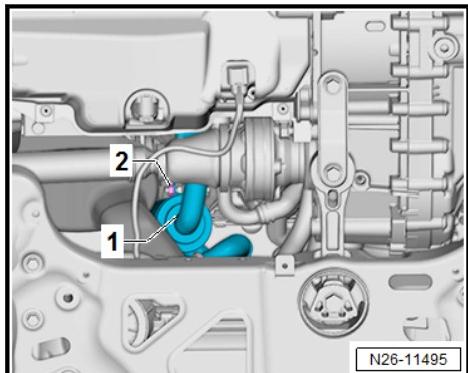
The procedure describes the conversion of the previous EGR filter to the current version. The connection to the turbocharger does not apply to the current version.

- Remove the bolts -2 and 3-.
- Remove the noise insulation -1- from the front bumper cover -4- toward the rear.

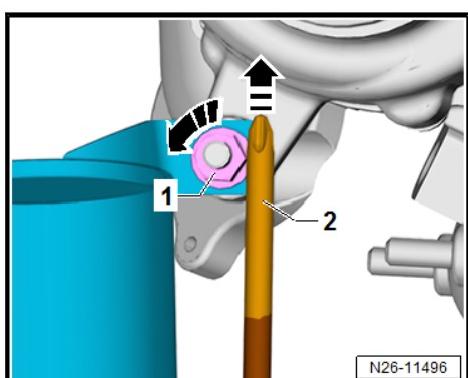




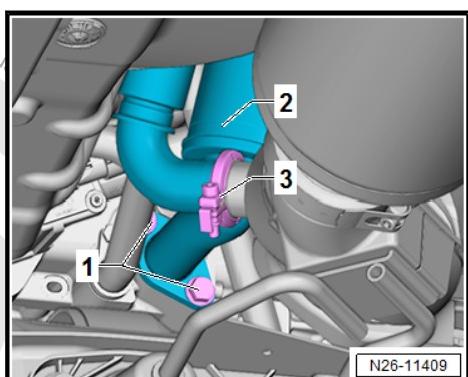
- Loosen the nut -2- from the EGR filter -1- from below using the 13 mm ratchet wrench.
- Wrap the point of the long screwdriver with tape.



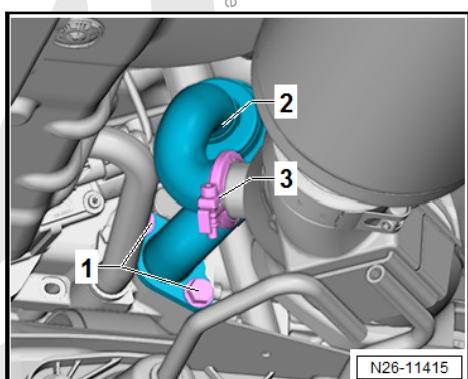
- Place the screwdriver -2- on the edge of the nut -1- and remove the nut by pushing up at the same time.
- Open and remove the clamp -3-.



- Remove the bolts -1- and the remove the EGR filter -2-.

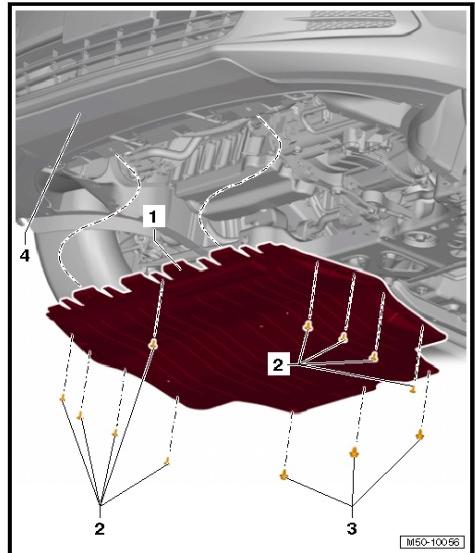


- Position the EGR filter with new seals, install the bolts -1- and tighten to 9 Nm.
- Position the clamp -3- and tighten to 3.5 Nm.





- Slide the noise insulation -1- forward into the front bumper cover -4-.
- Install the screws -2- and new -3- and tighten as follows:
  - ◆ Screw -2-: 2 Nm
  - ◆ Screw -3-: 6 Nm (replace)



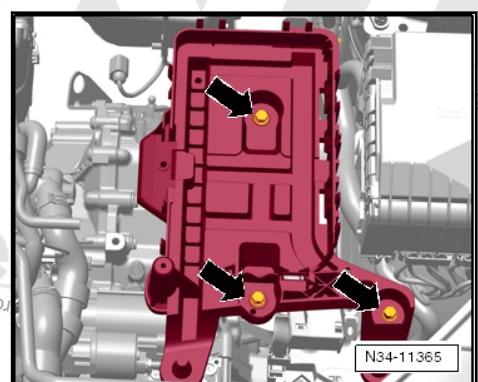
### 3.3 EGR Cooler, Removing and Installing, Engine Codes CBDA, CBDB, CEGA

#### Special tools and workshop equipment required

- ◆ Pry Lever - 80-200-
- ◆ Hose Clamps - Up To 25 mm - 3094-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Hose Clip Pliers - VAS6362-
- ◆ Engine Support Device - 3300A-
- ◆ Socket - Xzn 10 - T10385-

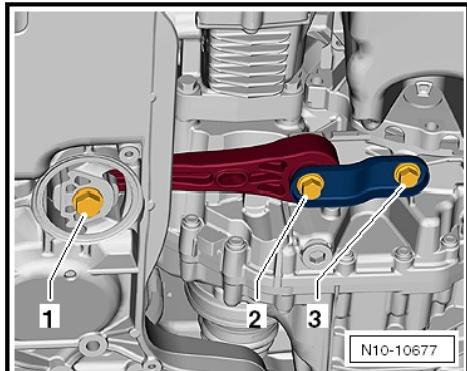
#### Removing

- Remove the air filter housing. Refer to [⇒ “3.16 Air Filter Housing, Removing and Installing”, page 315](#).
- Remove the battery. Refer to [⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Removing and Installing](#).
- Remove the bolts -arrows- and remove the battery mount -1-.
- Loosen the particulate filter and fasten it to the bulkhead. Refer to [⇒ “2.2 Particulate Filter, Removing and Installing”, page 371](#).

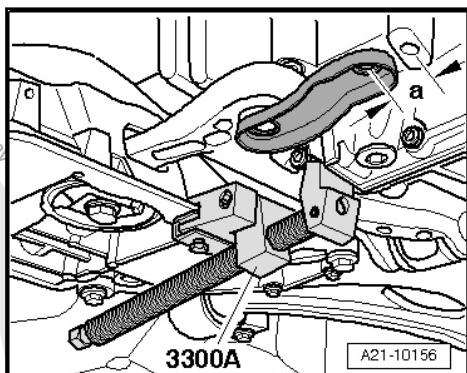




- Remove the bolts -1 to 3- and then remove the pendulum support.



- Press the engine forward to the dimension -a- with the -3300A- .
  - ◆ Dimension -a- = 35 mm

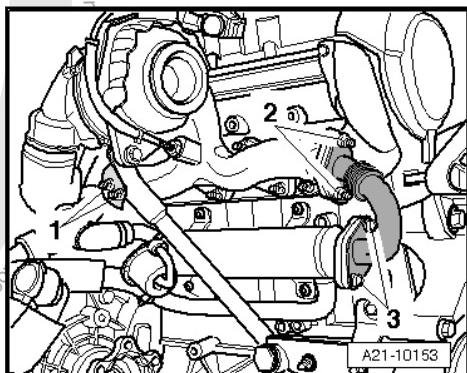


Remove the nuts -2- and the bolts -3-.

Remove the EGR pipe.

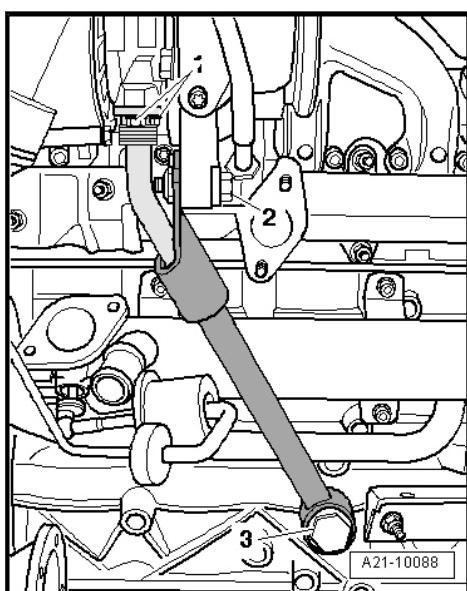
#### AWD Vehicles

- Remove the right drive axle. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Drive Axle; Drive Axle, Removing and Installing .
- Remove the right flange shaft from the bevel box. Refer to ⇒ Rep. Gr. 39 ; Front Final Drive; Overview - Front Final Drive .



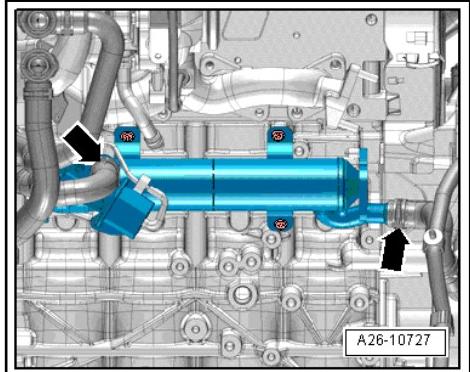
#### Continuation for All Vehicles

- Place the -VAS6208- under the engine.
- Remove the bolts -1 and 2- and the banjo bolt -3-.
- Remove the turbocharger support and the oil return pipe.





- Loosen the clamps -arrows- and then remove both the coolant hoses and -3094- from the EGR cooler.
- Remove the heat shield boot from the vacuum actuator.

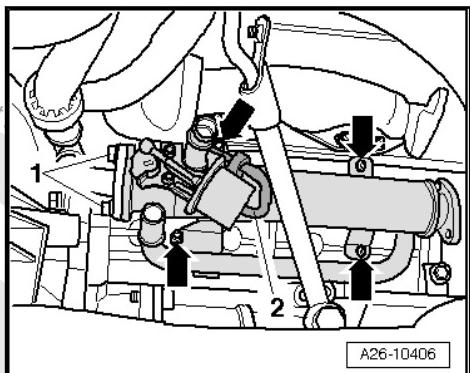


- Remove the bolts -1- for the EGR pipe using the -T10385- .
- Remove and free up the vacuum hose -2- from the vacuum actuator.
- Remove the bolts -arrows- and remove the EGR cooler.

### Installing

Install in reverse order of removal and note the following:

- Tightening specification. Refer to [⇒ “3.1.2 Overview - Exhaust Gas Recirculation, Engine Codes CJAA, CBEA”, page 379](#) .



#### Note

- ◆ Replace the seals, O-rings and self-locking nuts.
- ◆ Secure all hose connections with hose clamps appropriate for the model. Refer to the Parts Catalog.
- ◆ During installation, the heat shield boot must be installed at the same location.
- Install the turbocharger support.
- Install the battery tray and the battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Removing and Installing .
- Install the air filter housing. Refer to [⇒ “3.16 Air Filter Housing, Removing and Installing”, page 315](#) .
- Install the particulate filter. Refer to [⇒ “2.2 Particulate Filter, Removing and Installing”, page 371](#) .
- Check the coolant level.

## 3.4 EGR Cooler, Removing and Installing, Engine Code CJAA, CBEA

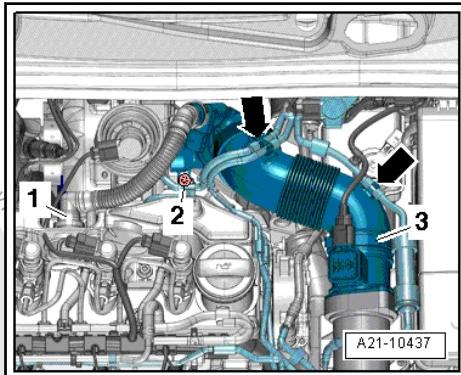
### Special tools and workshop equipment required

- ◆ Hose Clamps - Up To 25 mm - 3094-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Hose Clip Pliers - VAS6362-



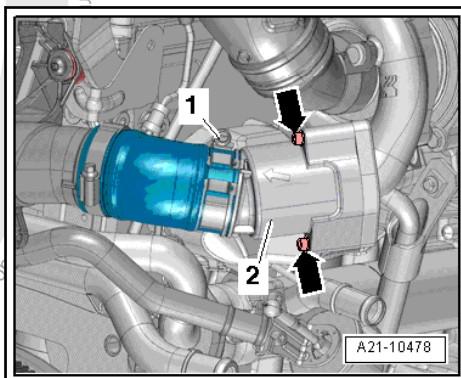
## Removing

- Remove the particulate filter. Refer to ["1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing", page 345](#).
- Press the release buttons and remove the crankcase ventilation hose -1-.
- Free up the vacuum hoses -arrows-.
- Remove the air duct pipe from the air filter housing, to do so loosen the hose clamp -3-.
- Remove the bolt -2- and pivot the air duct pipe with the intake tube toward the rear and remove it from the turbocharger.

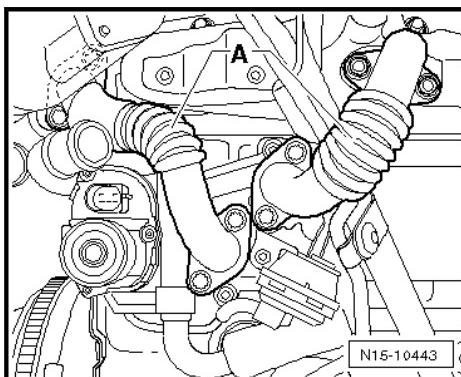


Remove the bolts -arrows-.

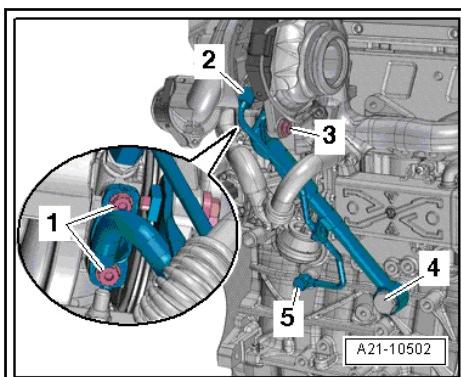
Loosen the hose clamps -1- and remove the pulsation damper -2-.



- Remove the bolts and the exhaust gas recirculation pipes -A-.



- Remove the bolts -1 and 3-, the union nut -2- and the banjo bolts -4 and 5-, then remove the turbocharger support and oil supply line.

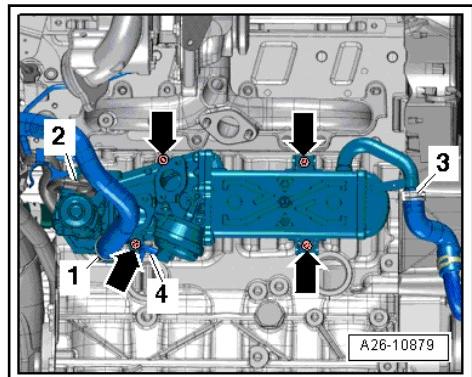




- Place the -VAS6208- under the engine.
- Clamp the coolant hoses -1 and 3- with -3094- and remove them from the EGR cooler.
- Disconnect the connector -2-.
- Remove the vacuum hose -4- from the vacuum adjusting element and free it up.
- Remove the bolts -arrows- and remove the EGR cooler.

### Installing

- Tightening specification. Refer to [“3.1.2 Overview - Exhaust Gas Recirculation, Engine Codes CJAA, CBEA”, page 379](#).



Install in reverse order of removal while noting the following:



#### Note

- ◆ Replace gaskets, seals and self-locking nuts.
- ◆ The hose connections as well as air duct pipes and hoses must be free of oil and grease before installing.
- ◆ Secure all hose connections with standard production hose clamps. Refer to the Parts Catalog.
- ◆ When installing, install all heat shield boots back in the same positions.
- Install the turbocharger support with oil supply line, the intake tube and the pulsation damper.
- Install the air guide hoses and screw-type clamps.
- Install the particulate filter. Refer to [“1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 345](#).
- Check the coolant level. Refer to [“1.10 Coolant, Draining and Filling”, page 192](#).

## 3.5 EGR Cooler, Checking for Leaks

### Special tools and workshop equipment required

- ◆ Turbo System Tester Kit - VAG1687-
- ◆ Turbo System Tester Kit - Adapter 11 - VAG1687/11-
- ◆ Turbo System Tester Kit - Adapter 15 - VAG1687/15- for 60 mm and 65 mm diameter exhaust pipes
- ◆ Turbo System Tester Kit - Adapter 16 - VAG1687/16- for 55 mm diameter exhaust pipe
- ◆ Cooling System Tester - Directional Valve - VAS691005/1-
- ◆ Cooling System Tester - Directional Valve - VAS691005/5-
- ◆ Digital Pressure Sensor - VAG1397B-



#### Note

The EGR cooler pressure will be reduced to 0.8 bar (11.6 psi) on the exhaust side. At the same time the pressure is measured in the cooling system.

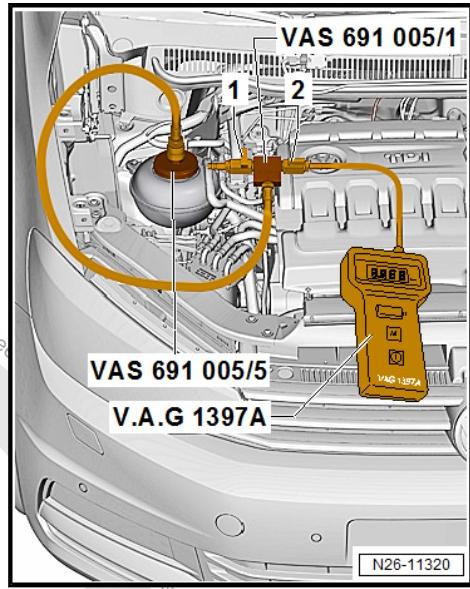


### Test conditions:

- Coolant temperature must be at least 40 °C (104 °F).

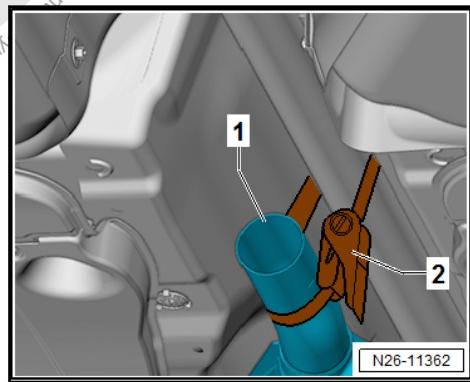
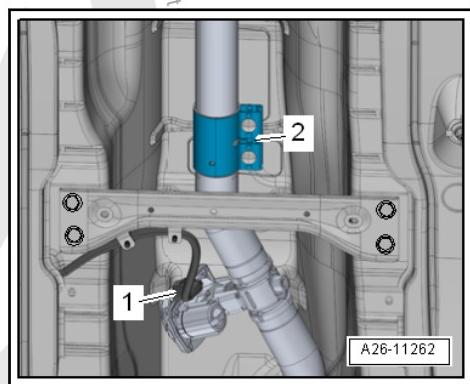
### Turbocharger Tester Kit - VAG1397A- , Connecting:

- Attach the Cooling System Tester - Directional Valve - VAS691005/5- to the coolant expansion tank.
- Attach the Cooling System Tester - Directional Valve - VAS691005/1- to the Cooling System Tester - Directional Valve - VAS691005/5- .
- Connect the valve -1- for connection »C« and open the valve -2- for connection »A«.
- Connect the hose from connection »A« from the Directional Valve to the connection »II« on the Turbocharger Tester Kit - VAG1397A- .
- Set the Turbocharger Tester Kit - VAG1397A- to switch setting »II« (relative pressure measurement) and turn it on. The »II« must be visible.



### Turbo System Tester Kit - VAG1687- , Connecting:

- If equipped, unclip the cable to the exhaust door control unit -1-.
- Loosen the clamping sleeve -2- on the exhaust pipe and slide it toward the rear.
- On vehicles without a tunnel brace the exhaust pipe -1- must be tied upward using a tensioning strap -2-.



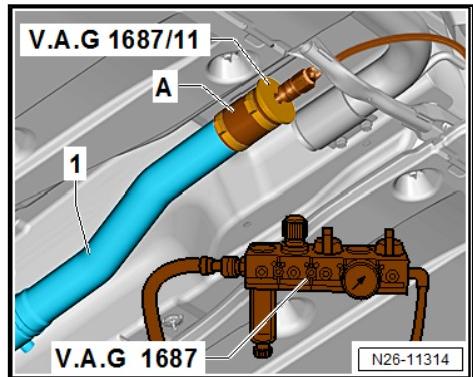


- Connect the Turbo System Tester Kit - Adapter 11 - VAG1687/11- with the hose -A- to the exhaust pipe (engine-side). Secure the hose with hose clamps.

Use the hose -A- for the exhaust pipes with 55 mm diameter = Turbo System Tester Kit - Adapter 16 - VAG1687/16- .

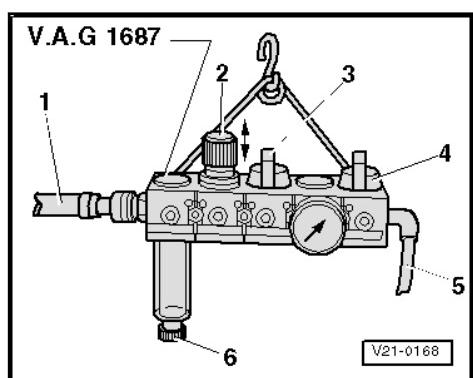
Use the hose -A- for the exhaust pipes with 60 mm or 65 mm diameter = Turbo System Tester Kit - Adapter 15 - VAG1687/15- .

- Connect the Turbo System Tester Kit - VAG1687- to the Turbo System Tester Kit - Adapter 11 - VAG1687/11- .



Prepare the Turbo System Tester Kit - VAG1687- as follows:

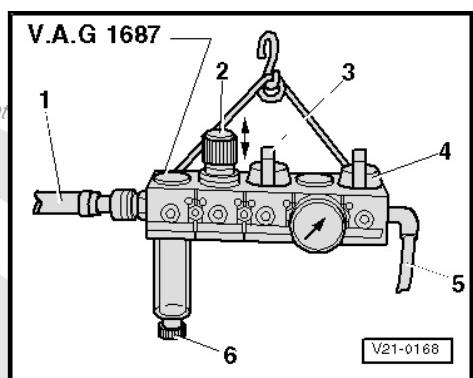
- Completely remove the pressure regulating valve -2- and close the valves -3 and 4-.
- The knob must face upward so the pressure regulating valve -2- can be turned.
- Connect the Turbo System Tester Kit - VAG1687- to the compressed air -1-.



- Open the valve -3-.
- Set the pressure to 0.8 bar (11.6 psi) using the pressure regulating valve -2-.
- Open the valve -4- and wait until the test circuit is filled. Regulate the pressure to 0.8 bar (11.6 psi) again if necessary.



*A small quantity of air dissipates via the valves in the engine. For this reason a pressure retention test is not possible.*

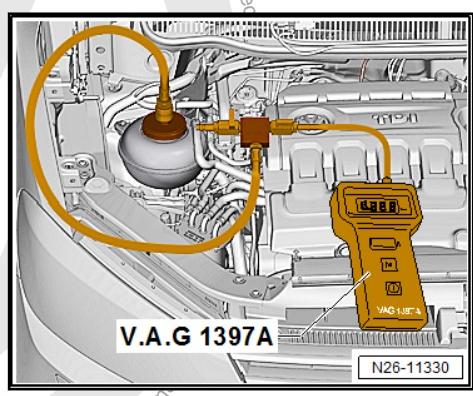


#### Turbocharger Tester Kit - VAG1397A- , Reading:

- Watch the Turbocharger Tester Kit for approximately five minutes.
- The pressure displayed on the Turbocharger Tester Kit must not increase above 0.025 bar (0.36 psi)
- If the pressure increases above 0.025 bar (0.36 psi) on the Turbocharger Tester Kit , compressed air is leaking from the exhaust side in the cooling system. The EGR cooler is leaking. Replace the EGR cooler.



*A vacuum can occur when cooling the coolant. The vacuum is displayed on the Turbocharger Tester using a »negative« symbol. Values with a »minus« do not indicate a leak. If uncertain, create a pressure balance in the cooling system and repeat the test.*



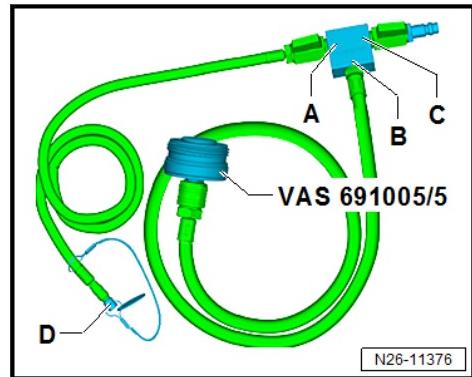


## Cooling System Tester - Directional Valve - VAS691005/1- , Cleaning:



After completing the leak test, the Cooling System Tester - Directional Valve - VAS691005/1- must be cleaned to remove any entrapped moisture.

- Insert the cleaning nozzle -D- in the hose from connection -A- on the Directional Valve .
- Connect the Cooling System Tester - Directional Valve - VAS691005/5- on the hose from the connector -B-.
- Connect the pressure hose to the connection -C-.
- Open the shut-off valves and blow through the hose for approximately 15 seconds.



## 3.6 EGR Temperature Sensor , Removing and Installing

### Special tools and workshop equipment required

- ◆ Hose Clamps Up To 25 mm - 3094-
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Shop Crane - Drip Tray - VAS6208-
- ◆ Hose Clip Pliers - VAS6362-
- ◆ EGR Temp. Sensor Socket - 14mm - T10401-

### Conditions

- Ignition switched off.
- Engine must be cold.

### Procedure

- Overview of vehicle from below:
- Remove the noise insulation. Refer to => Body Exterior; Rep. Gr. 66 ; Noise Insulation; Overview - Noise Insulation .
- Drain the coolant. Refer to => [“1.10 Coolant, Draining and Filling”, page 192](#) .



The coolant hoses indicated must be removed and moved to the side to perform assembly work on the EGR Temperature Sensor - G98- .



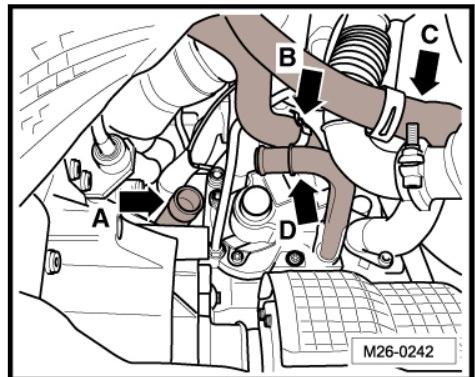
- Disconnect the coolant hoses from both connections -arrows A and D-.
- Lay aside both coolant hoses -arrows B and C- as shown.
- Assembly overview of engine compartment from above:
- Remove the engine cover. Refer to [“1.6 Engine Cover, Removing and Installing”, page 87](#).



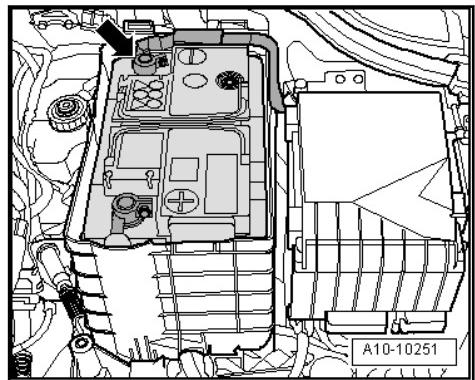
#### Caution

*Electronic components could be destroyed when the Battery is disconnected:*

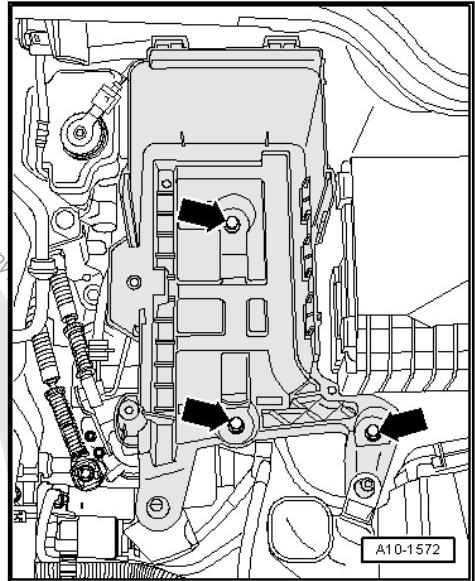
- ◆ *Follow the steps for disconnecting the Battery .*



- With the ignition switched off, disconnect the ground cable -arrow- from the Battery .
- Remove the air filter housing. Refer to [“3.15 Overview - Air Filter”, page 311](#) .



- Remove the Battery and the battery tray -arrows-.



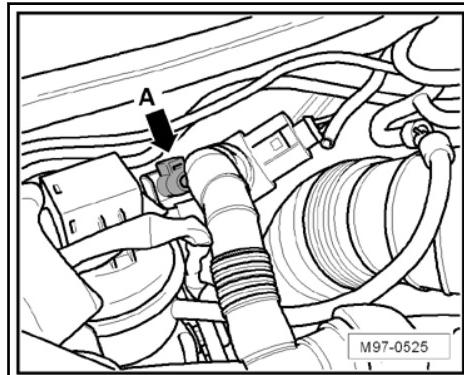
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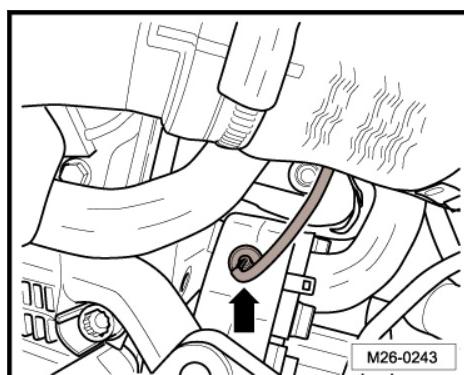
- Disconnect the connector from the EGR Temperature Sensor - G98- -arrow A- and guide the wire out.



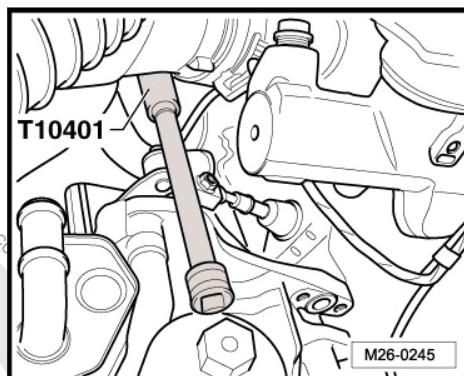
*Note the installation location of the lines and heat shield.*



The illustration shows the EGR Temperature Sensor - G98- as seen from the engine compartment looking out from the transmission side -arrow- below the brake master cylinder.



- Carefully guide the EGR Temp. Sensor Socket - 14mm - T10401- onto the EGR Temperature Sensor - G98- with a socket extension.





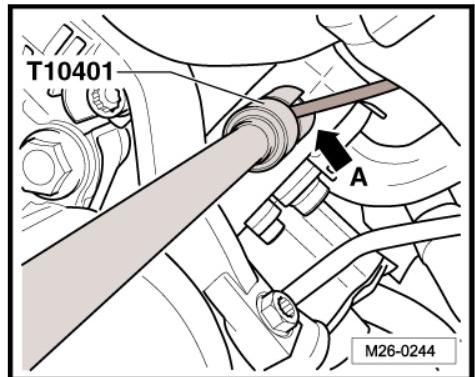
- Make sure the cable from EGR Temperature Sensor - G98- is guided in the groove of EGR Temp. Sensor Socket - 14mm - T10401- -arrow A-.
- Loosen the EGR Temperature Sensor - G98- and remove it.

**Install in Reverse Order of Removal. Note the Following:**



#### Note

- ◆ *EGR Temperature Sensor - G98- tightening specification, 20 Nm*
- ◆ *Cut out the gasket and replace if it is damaged or leaks.*
- ◆ *Maintain the tightening specification.*



#### Caution

*Secure the heat shield mats in their original installed position.  
 Check the entire connection for secure fit.  
 Replace the self-locking nuts, the seals, the gaskets and clamps.  
 Hoses are secured with spring clips.  
 Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*

## 3.7 EGR System, Cleaning

⇒ “[3.7.1 EGR System Cleaning Procedure, Initiating](#)”, page 393

⇒ “[3.7.2 EGR Valve N18 and Connecting Pipe, Cleaning](#)”, page 398

#### Special tools and workshop equipment required

- ◆ Cooler Flushing System for Exhaust Gas Recirculation - VAS542007-
- ◆ Cooler Flushing System for Exhaust Gas Recirculation - Adapter Set - VAS542007/4-
- ◆ Socket - Xzn 10 - T10385-
- ◆ M8 nut (quantity: 2)

#### Explanation

For some extreme driving profiles (for example, driving tracks), varnish or coking may occur on the inside of the EGR cooler. If this is the case, the malfunction indicator lamp will turn on in the instrument cluster, and the following code will appear in the DTC memory:

- ◆ P0401 „EGR system delivery rate too small“

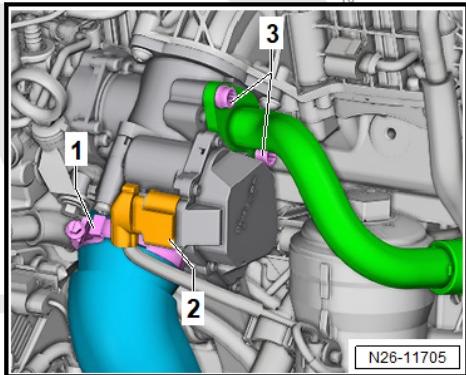
In most scenarios, this coking can be cleaned by the described flushing or cleaning procedures. Refer to ⇒ “[3.7.1 EGR System Cleaning Procedure, Initiating](#)”, page 393”.

## 3.7.1 EGR System Cleaning Procedure, Initiating

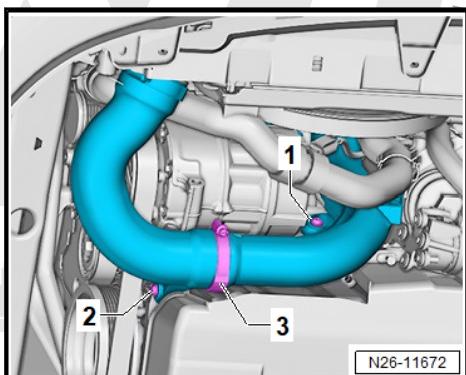
- Remove the engine cover. Refer to ⇒ “[1.6 Engine Cover, Removing and Installing](#)”, page 87 .



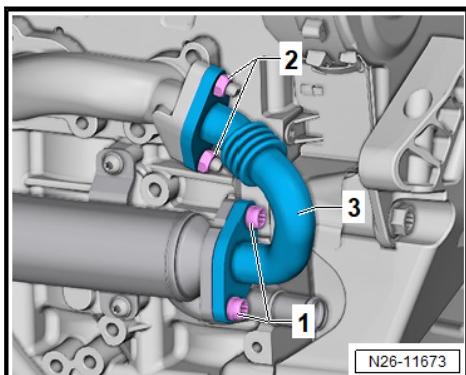
- Open the clamp -1-, remove the connector -2-, and remove the bolts -3-.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation ..
- Remove the bolt -1- and if installed, remove the bolt -2-.



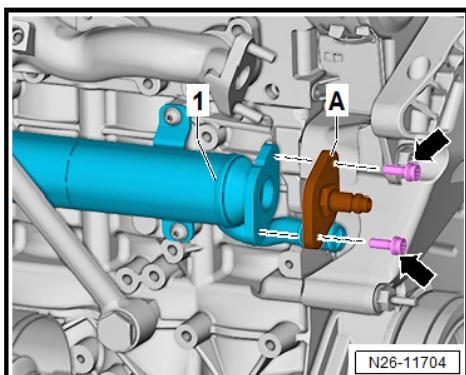
- Open the clamp -3- and disconnect the hose.
- Carefully pull the charge air pipe as much as possible downward. Pay attention to the wires.



- Remove the bolts -1- and nuts -2-.
- Remove the connecting pipe -3-.
- Place the Adapter - VAS542007/4-2- -A- on the opening on the EGR cooler -1-.

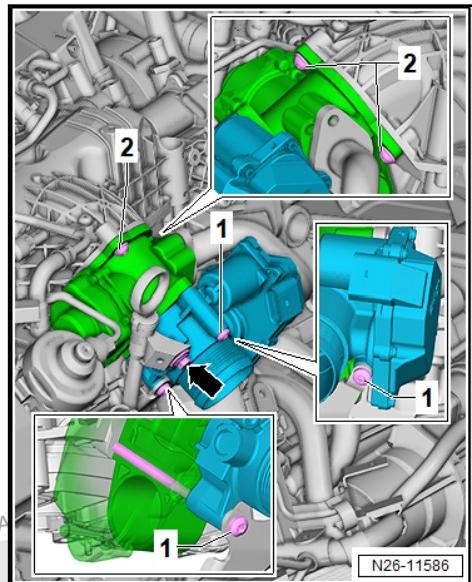


- Screw in the original bolts -arrows- on the connecting pipe and tighten hand-tight. Make sure the seal on the adapter is not crushed.
- Connect the Supply Hose - VAS542007/2-2- from the cleaning device to the adapter on the EGR cooler.
- Remove the bolt -arrow- from the oil dipstick bracket and remove the bolts -1-, and remove the throttle valve control module.





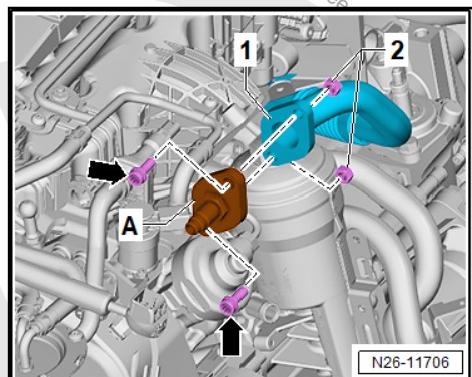
- Remove the bolts -2-, remove the EGR valve while removing the connector on the EGR valve.
- Place the Adapter - VAS542007/4-2- -A- on the opening on the connecting pipe -1-.



- Screw in the original bolts -arrows- on the connecting pipe and tighten the M8 nuts -2- hand-tight. Make sure the seal on the adapter is not crushed.
- Connect the Return Hose - VAS542007/2-3- from the cleaning device to the adapter -A- on the connecting pipe.
- Connect the battery charger to the vehicle battery.
- Connect the terminal clamps from the Pump - VAS542007/3- to the vehicle battery.

#### Cooler Flushing System for Exhaust Gas Recirculation - VAS542007- , Preparing

- Fill the Canister - VAS542007/1- with 9 liters of warm tap water (ca. 40 - 50°C) (104 - 122 °F).
- Add one liter of Cleaner - D 600 200 A2- to the canister.
- Connect the Intake Hose - VAS542007/2-1- from the pump to the connection -1- on the canister cover.



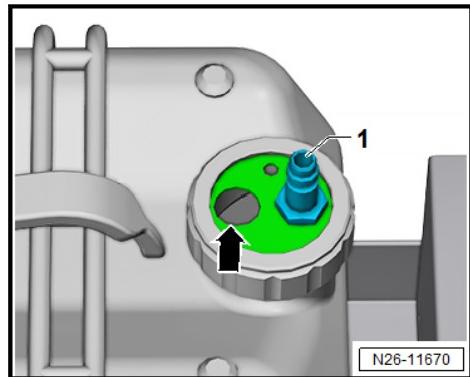


- Guide the open end of the Return Hose - VAS542007/2-3- in the opening -arrow- on the canister cover to approximately halfway up the canister height.

**Note**

*Make sure the bleeder valve on the supply hose is closed.*

- Clean the EGR valve and connecting pipe while the cleaning process is running. Refer to ["3.7.2 EGR Valve N18 and Connecting Pipe, Cleaning", page 398](#).
- Operate the Pump - VAS542007/3- as follows:



Pump - VAS542007/3-	Time	Action
Switching on	25 min	Cleaning
Switching off	10 min	Using the cleaning solution
Switching on	25 min	Cleaning
Switching off	-	End of cleaning procedure

- Disconnect the intake hose from the canister, switch on the pump until cleaning solution is no longer required (draining the system).
- Remove the return hose from the canister, and pay attention to the dripping cleaning solution.
- Empty the canister, note the country-specific disposal regulations.
- Fill the canister with 10 liters of warm tap water (approximately 40°C - 50°C) (104 - 122 °F).
- Connect the Intake Hose - VAS542007/2-1- from the pump to the connection on the canister cover.
- Guide the Return Hose - VAS542007/2-3- into a suitable container (minimum 12 liter capacity) and secure.
- Switch on the Pump - VAS542007/3- until the content in the canister has completely flowed through the EGR system.
- Release the Supply Hose - VAS542007/2-2- from the adapter on the EGR cooler and remove.
- Release the Return Hose - VAS542007/2-3- from the adapter on the connecting pipe and remove.

**Note**

*The residual water blows out opposite of the flow direction.*

- Connect the Return Hose - VAS542007/2-3- now to the adapter on the EGR cooler.
- Connect the Adapter - VAS542007/5- to the adapter on the connecting pipe.
- Guide the open end of the Return Hose - VAS542007/2-3- in the opening -arrow- on the canister cover to approximately halfway up the canister height.

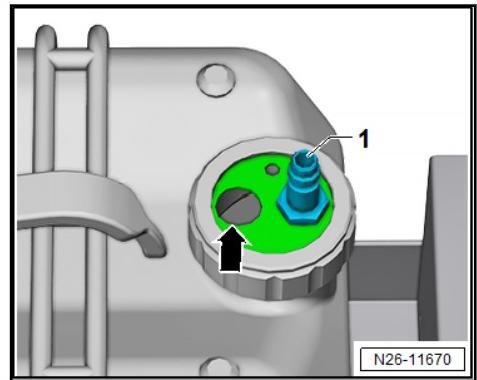


- The Intake Hose - VAS542007/2-1- from the pump must be connected to the connection -1- on the canister cover.
- Connect the pressure line to the Adapter - VAS542007/5- and blow the residual water completely out of the EGR system.



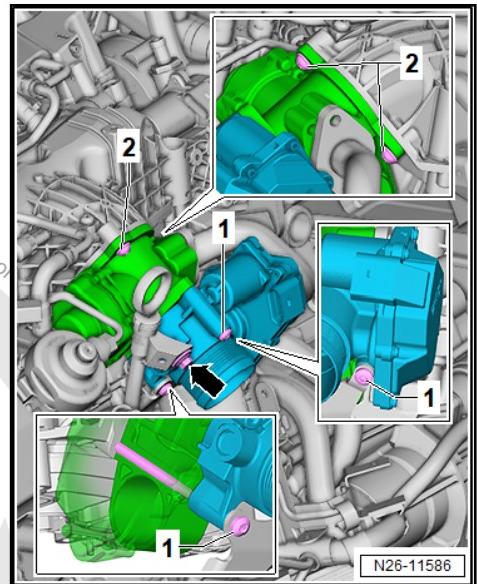
**Caution**

*The water must be completely removed from the EGR system. Otherwise, it may cause engine damage.*



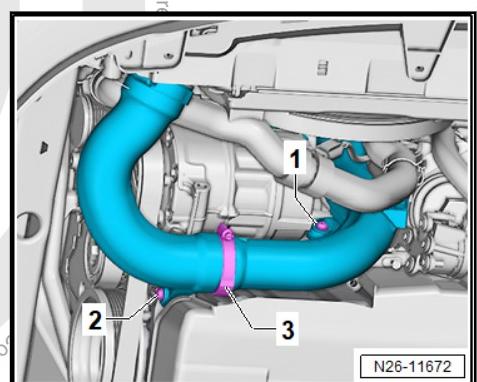
N26-11670

- Release and remove the Adapter - VAS542007/5- .
- Remove the adapter from the connecting pipe.
- Remove the adapter from the EGR cooler, and install the connecting pipe with new seals and new nuts. Refer to ["3.1.1 Overview - Exhaust Gas Recirculation, Engine Codes CBDA, CBDB, CEGA", page 378](#) .
- Install the EGR valve. Refer to ["3.13 Overview - Intake Manifold with Attachments", page 307](#) .
- Slide the charge air pipe upward on the throttle valve control module connection.
- Install the screws -1 and 2- and tighten to 9 Nm.



N26-11586

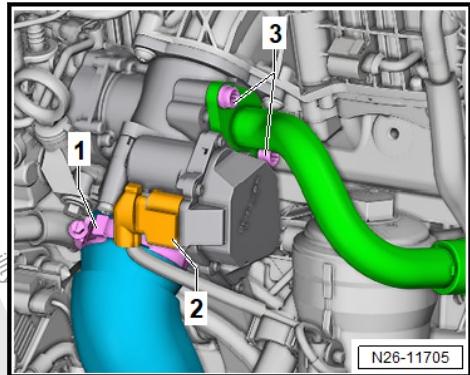
- Mount the hose, position the clamp -3- and tighten to 8 Nm.
- Install the noise insulation. Refer to [Body Exterior; Rep. Gr. 50 ; Noise Insulation](#) .
- Position the clamp -1-, tighten to 8 Nm, and connect the connector -2-.



N26-11672



- Install the connecting pipe with a new seal. Refer to ["3.13 Overview - Intake Manifold with Attachments", page 307](#).



### 3.7.2 EGR Valve - N18- and Connecting Pipe, Cleaning

#### Special tools and workshop equipment required

- Ultrasonic Cleaning Unit - VAS6418-

Remove large and stuck contaminants on the valve stem and valve plate with a wood or plastic scraper, for example from the Scraper Set - VAS6845- .

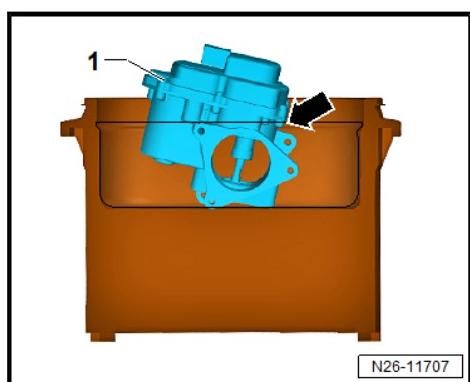
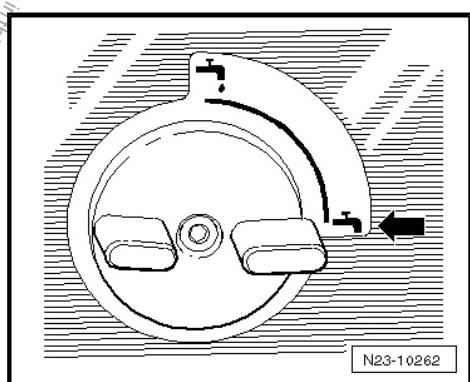
- Connect the drain valve -arrow- of the Ultrasonic Cleaning Unit - VAS6418- to the right side of the transmission housing.



#### Note

The warm-up process of the ultrasonic bath can be accelerated if warm tap water is used.

- Fill the Ultrasonic Cleaning Unit - VAS6418- with 1800 ml tap water and 200 ml Cleaner - D 600 200 A2- .
- Insert the EGR valve and connecting pipe. Make sure the EGR valve electronics -arrow- are not in the cleaning solution or device.
- Switch on the cleaning unit by pressing the [on/off] button -C-.



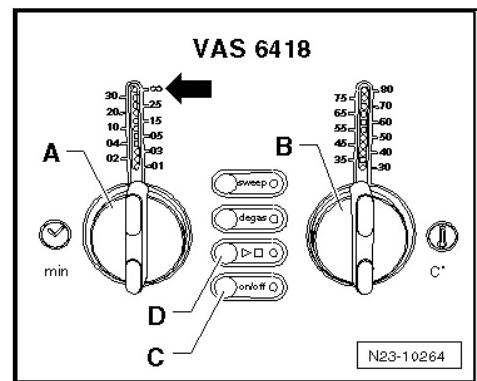


- Turn the thermostat switch -B- until the indicator light is at 40 °C (104 °F).
- Position the knob for the operation time -A- to “10” -arrow-.
- Press □ -D- for more than two seconds and this turns the device on.



#### Note

*The temperature controlled cleaning is now switched on. During the heating-up phase the ultrasonic switches on the cleaning fluid circulation in intervals. After reaching the pre-selected temperature the ultrasonic is switched on for a long period. The duration of the cleaning process must be at least 10 minutes and must start when the temperature is minimum 40° C (104 °F)*



- After successfully cleaning, flush the connecting pipe with clear water and blow out with compressed air.
- Clean the EGR valve only in the valve stem and valve plate areas with clear water.





## 28 – Ignition/Glow Plug System

### 1 Glow Plugs

- ⇒ “1.1 General Information”, page 400
- ⇒ “1.2 Glow Plug, Removing and Installing”, page 400
- ⇒ “1.3 Glow Plug Connectors, Removing and Installing”, page 402

#### 1.1 General Information



The Engine Control Module - J623- is equipped with a DTC memory. Before and after repairs or adjustments, the DTC memory must be checked. Refer to Vehicle Diagnostic Tester “Guided Fault Finding”.

#### 1.2 Glow Plug, Removing and Installing

##### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm - VAG1331-
- ◆ Engine Bung Set - VAS6122- (not illustrated)
- ◆ Hose Clip Pliers - VAS6362-
- ◆ Glow Plug Socket - VAS6454-



##### DANGER!

- ◆ Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 277 .
- ◆ Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 279 .

Always pay attention to these instructions before and during work.

##### Removing:

##### Requirements

- Ignition switched off.
- Engine must be cold.

##### Procedure



- ◆ When removing the glow plugs, make sure no contaminants enter the fuel system and the glow plug duct.
- ◆ Seal off the connections in the fuel system using the plugs from the -VAS6122- .

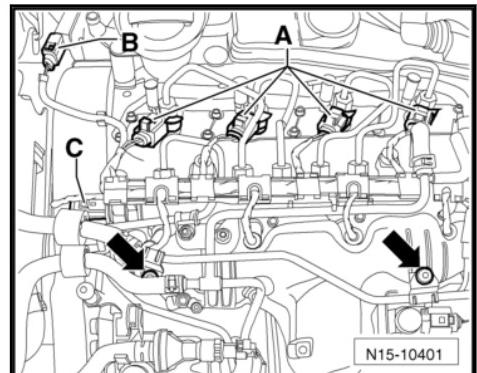


- Remove the engine cover. Refer to [“1.6 Engine Cover, Removing and Installing”, page 87](#).
  - Remove the protective strip, if equipped -Item 1- [Item 1 \(page 286\)](#).
  - Disconnect from the fuel injectors -A-, the Exhaust Pressure Sensor 2 - G451- -B- and the Fuel Pressure Sensor - G247-C.
  - Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.
  - Remove the fuel return line bolt -Item 3- [Item 3 \(page 286\)](#) on the intake manifold.

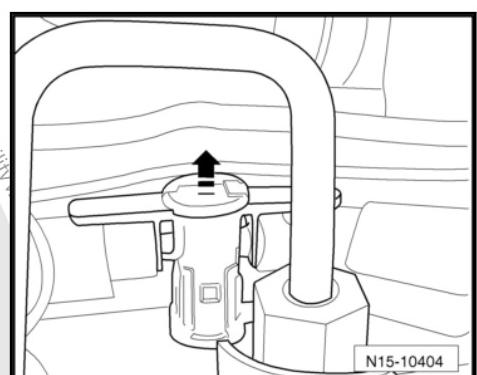
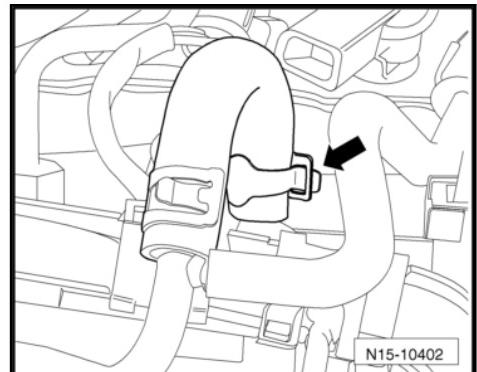


## **Caution**

*Always follow the procedure »Glow Plug Connectors, Removing and Installing«.*



- Remove the glow plug connectors. Refer to [“1.3 Glow Plug Connectors, Removing and Installing”, page 402](#).
  - Loosen the hose clip -arrow- with the -VAS6362- and remove the line on the rail element (high pressure reservoir).
  - Before removing, clean the return line connection on the fuel injectors (for example using a commercially available detergent).
  - Dry the return line connections.
  - Cover the return line connections with a cleaning cloth.



## Note

*Pay attention to cleanliness. Dirt and contaminants must not enter the return lines and the connections on the fuel injectors.*

- Loosen the spring clamp with the -VAS6362- and remove the fuel return line -Item 4- **⇒ Item 4 (page 286)**.

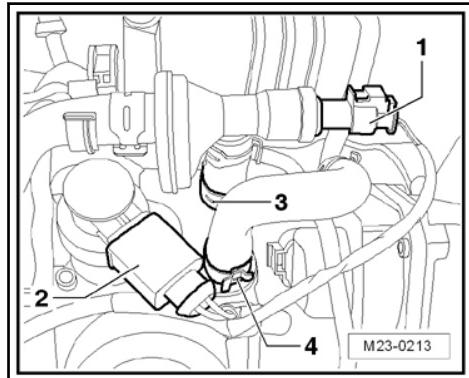


- Loosen the spring clamp -4- with the -VAS6362- and disconnect the fuel return line at the high pressure fuel pump.
- Seal the lines so that no dirt can enter the fuel system.
- Remove the fuel return lines -Item 2- [⇒ Item 2 \(page 286\)](#) and lay them in front of the intake manifold.
- Remove the glow plug wiring guide and lay it aside.



**Caution**

- ◆ *When cleaning the glow plug duct, make sure no contaminants or cleaning solutions enter the connector contacts on the glow plugs.*
- ◆ *Do not clean the connectors with cleaning solutions or compressed air.*



- Clean the glow plug duct in the cylinder head (contaminants must not fall into the cylinder).



**Note**

- ◆ *Extract large contaminants with a vacuum cleaner.*
  - ◆ *Clean glow plugs with a commercially available detergent.*
  - ◆ *Dry the glow plugs with compressed air.*
  - ◆ *Then clean the glow plug duct with a rag dampened with oil.*
- Remove the glow plugs with the -VAS6454- .

**Installing:**

Install in reverse order of removal. Note the following:

- When installing the glow plugs, make sure no contaminants enter the fuel system and the glow plug duct.
- Only remove the sealing plugs right before installing the fuel return lines.
- Make sure the line connections are secure.
- Tighten the glow plugs with the - VAS6454- .
- Tightening specification: 12 Nm.
- Secure the fuel return line to the intake manifold.
- Tightening specification -Item 3- [⇒ Item 3 \(page 286\)](#)
- Install the glow plug connectors. Refer to [“1.3 Glow Plug Connectors, Removing and Installing”, page 402](#) .
- Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester “Guided Functions”.

## 1.3 Glow Plug Connectors, Removing and Installing

### Special tools and workshop equipment required

- ◆ Wheel Bolt Cap Pliers - 3314-



## Removing:



### Caution

*Before removing the glow plug connectors, note that different installation depths for the glow plugs in their respective cylinders.*

- Position the -3314- with the groove -arrow A- on the upper collar of the connector -arrow B- and press together lightly.



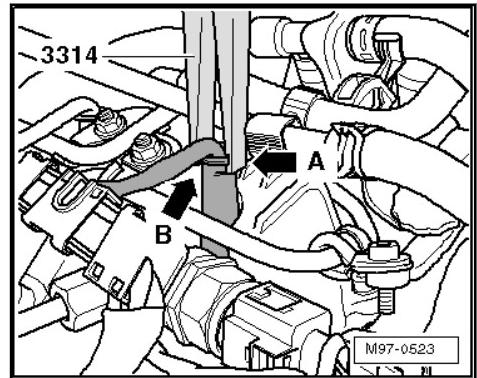
### Caution

*Position the pliers so they do not touch or damage the cable.*

*Only use suitable tools.*

*Other unsuitable tools can damage the connector.*

*If the connector is damaged when removing it, replace the entire wiring harness including the connector (a connector cannot be replaced separately).*



- Pull the connector carefully off the glow plug in the direction of the -arrow- using -3314- .



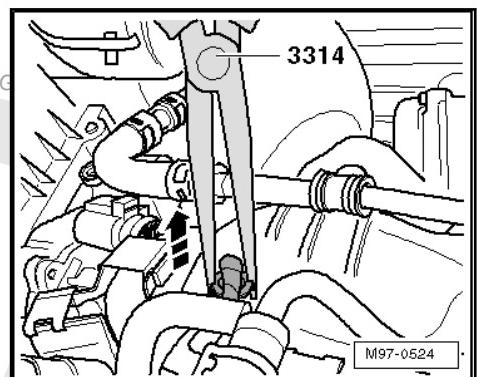
### Caution

*Do not pull abruptly on the connector.*

*Do not damage the connector wire.*

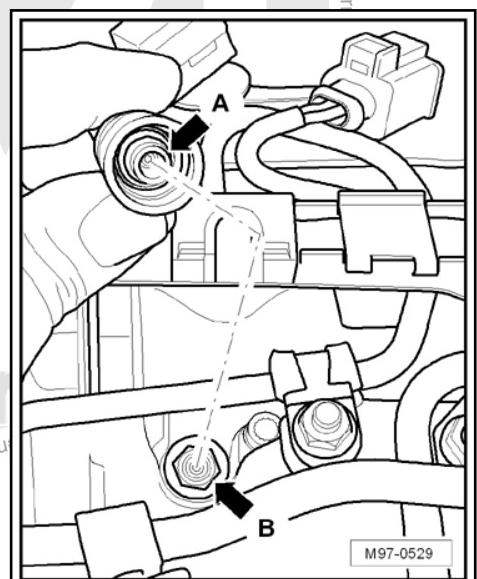
*Do not press the pliers together too firmly or the connector will be damaged.*

*The connector is surrounded by a protective sleeve; if damaged, the protective sleeve can be replaced.*



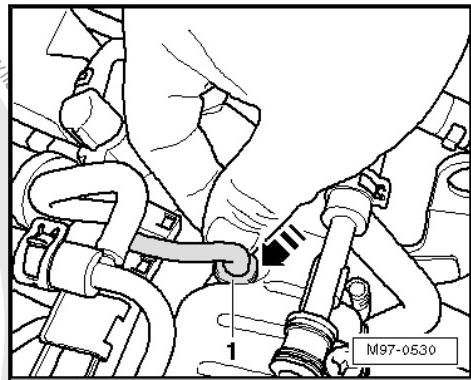
## Installing:

- Guide the center terminal on the connector -arrow A- into the glow plug socket -arrow B- by hand.





- Press the glow plug connector -1- on by hand in direction of -arrow- until it engages.



## Cautions & Warnings

Please read these **WARNINGS** and **CAUTIONS** before proceeding with maintenance and repair work. You must answer that you have read and you understand these **WARNINGS** and **CAUTIONS** before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the Volkswagen Factory Approved Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.
- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

## Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.
- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.
- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

## Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the Volkswagen Factory Approved Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

**I have read and I understand these Cautions and Warnings.**

